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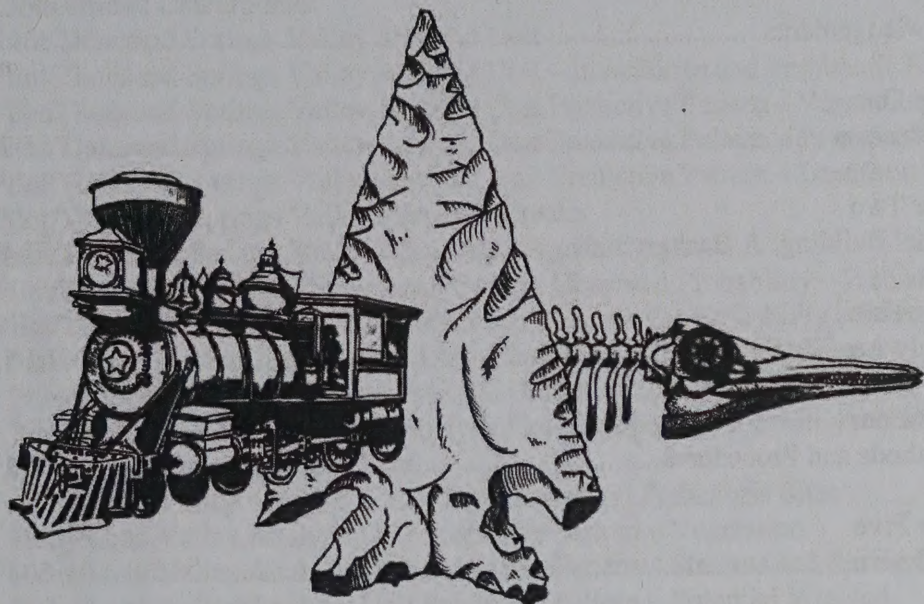

Great Basin Restoration Initiative: Cultural Resources Landscape Level Planning Model

by

Michael Drews
Eric Ingbar
Alyce Branigan

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I. INTRODUCTION

The Great Basin Restoration Initiative (GBRI) is a multi-state, multi-agency, state, local, and federal initiative focused on "restoration" of the sage/pinion/juniper biome within 75 million acres of the Great Basin. To advance restoration efforts, ecological planning boundaries were created and multiple-use management goals, including those pertaining to cultural resource management and protection were, or are in the process of, being developed. Many of the management goals of the GBRI can be accomplished if cultural resources (significant historic, prehistoric, and ethnohistoric sites and localities) can be managed in a more efficient manner.

One way to facilitate management and planning is to develop and test cultural resource distribution models that predict site density and distribution for planning purposes. Over the last several years, predictive models have been generated for relatively large hydrologic basins (Railroad Valley and Pine Valley) in Nevada (Drews et al. 2002; Zeanah 1998) and Utah (Zeanah 2001). These models are based on relatively fine-grained analyses of landscape, soils and geomorphology and they predict cultural trends that appear to be valid within their respective hydrologic basin.

While landforms and vegetation classes are relatively consistent across the Great Basin, orthographic effects of bounding mountain ranges create microclimates within each hydrographic basin so that vegetation and landform mosaics are not always comparable across broad areas of the landscape. The challenge for the GBRI cultural resources model is to test a larger area, coarser, landscape level modeling. Based on the model, areas within the GBRI area can be more effectively managed to ensure efficient use of a BLM district's resources while furthering the goals of the GBRI. The model should be a basis for understanding history and prehistory of the GBRI landscape and how humans have positioned themselves on the landscape over time.

With that task in mind, an extensive project boundary consisting of 12 major hydrographic basins covering 20,533,700 acres within Nevada, Utah, and Idaho was chosen for study. The area includes environments typical of Nevada basins, the Snake River plateau, and the Great Salt Lake basin. Model results are useful to managers at the Bureau of Land Management, Elko and Ely field offices in Nevada; the Salt Lake, Filmore and Cedar City Field Offices in Utah; and the Owyhee and Jarbidge field offices in Idaho.

A Perspective on Study Goals

The goals of this study are, to be frank, more managerial than anthropological. Our charge was to examine where archaeology is most likely to be found, and when found, where it was most likely to be an impediment to Great Basin Restoration Initiative land use goals. The management orientation of this study does not mean there is no component of science to it. Our ability to formulate reasonable hypotheses about historic and prehistoric settlement patterns – to devise simple initial models at all – derives from research by ourselves but especially by others. We make no claim to be doing "deep

science" in the hypothetico-deductive mode in this study. Nevertheless, we have striven to make the results and information useful to those interested in more focused work of that sort.

The sheer size of the study area itself precludes all but the most cursory of scientific,deductive, model-building on human behavior. Typically, one requires very fine-grained information for particular time periods to create an effective deductive study. For instance, Zeanah (1995) used an area approximately 5% the size of this study area for his analysis of prehistoric foraging patterns and the resulting archaeological record in Churchill County, Nevada. As we discuss below, the study has utility for management *and* for researchers, but in different ways.

Management and Implementation Goals

A central concern with most models is how managers will interpret and implement the results. The goal of this project is *not* to create a lock step management document (e.g., prescribed treatment within specific areas), but rather as a planning tool for BLM managers, biologists, and cultural resource specialists to evaluate potential conflicts as they work within the GBRI. From this general perspective, several research questions can be generated.

- Which landscape factors are the best predictors of cultural resource location?
- What management characteristics in terms of National Register status or Cultural Resource Use Allocations do resources have, and how are they distributed? (cf. BLM Manual Section 8110, "Identifying Cultural Resources")
- Do sensitivity boundaries relate to criteria that are readily observable in the field and can they be identified through simple overlay of available data? Are more complex analyses required for the model to be effective?
- Is the planning model a useful tool to aid in the identification of areas where imminent threats from natural or human caused actions may cause deterioration of significant cultural resources?
- Defining limits of knowledge and areas of further information needs.
- Procedural recommendations concerning subsequent data gathering, testing and strengthening of the model.

The work also provides a chance to contrast the management outcomes of broad-scale, inductive models with detailed deductive models based on optimal foraging theory. Railroad Valley, Pine Valley, and the Dugway Proving Grounds area all lay within or nearby the study area. These three areas are or have been examined with detailed forager behavior models. The anthropological models have resulted in a consideration of management plans and needs within respective study areas. Those models provide an informative contrast to this large-scale model.

Anthropological Goals

The large, and diverse, scientific literature on human settlement patterns is the anthropological context of this study. Although the study goals are, in essence, the discovery of correlation and not its explanation, settlement pattern is necessarily an outcome of the study too. This study undoubtedly raises more questions than it attempts to answer. That is one of the shortcomings of correlation approaches in general. Nevertheless, our intent is that the questions that it raises are themselves useful scientific leads for further research.

Some of the questions that a study such as this leaves unanswered but tantalizingly available for speculation include: Are there discernable relationships between site assemblages and the landscape? Springs and other perennial or predictable seasonal water sources are thought to be attractants of prehistoric use. Is this really the case? What about the potential for buried sites; is this usually greater near springs? Likewise, is there a discernable pattern of early sites along Late Pleistocene/Early Holocene lakeshore margins? Are potential wetland environments good predictors of sites density?

Beyond settlement pattern studies themselves, there are questions of change through time in the prehistoric archaeological record that the study examines in broad view. Subsistence change was one such question that we hoped to address. The occurrence of pinyon pine in the study area and its role as a dietary staple generates several issues of interest. Over time, pinyon has general spread from south to north, fluctuating up and down in elevation in response to temperature and precipitation regimes (Grayson 1983). Pinyon may have never been present in the northernmost portion of the study area.

We assume that there is a detectable archaeological signature for pinyon exploitation. In many parts of the basin, that signature is rock rings and groundstone implements, within proximity to the current pinyon-juniper zone (see Thomas and Bettinger 1976:272). Sites containing those features may indicate the overall range of pinyon through time, in terms of its expansion from the south, as well as localized elevational expansion and contraction.

This assumption may be faulty since groundstone could have been used to process any number of seed resources and all vegetation expands and contracts with climatic variation. Site density alone may be a better measure of exploitable resource zones.

Several antelope traps are known from this part of the Great Basin. The west central portion of the study area is characterized by high mountains that collect moisture during the winter and with relatively low, open valleys that come into production during early spring and are moistened by runoff late into the summer. Valleys provide ample forbs and browse. Open juniper woodlands in the foothills provide access to construction materials for drive fences. Analysis of landscape in the vicinity of known antelope drives may serve to develop a testable hypothesis for site location.

Potential grasslands in the Snake River uplands may have provided prime bison habitat. A correlation between grasslands and Northern Side-notched projectile points might suggest big game hunting.

The distribution of Fremont sites across the landscape may reveal land use patterning and contingencies for site location relative to productive agricultural lands or specific resource procurement areas. Likewise the distribution of Late Prehistoric and pre-contact projectile points may identify Numic progressions from south to north across the project area.

Because of the size of the project area and the goals of the GBRI, the cultural resources models (one for prehistoric, another for historic period) is not spatially or temporally fine-grained. We used hundreds of spatial units for soils, vegetation, and topography. Yet, the size of the study area was so large that even the smallest spatial units are equal in size to the largest spatial units in for example, the Pine Valley study. Large area, landscape-level datasets were tested as predictors of cultural resource distribution and significance. In a sense, the study tests both the correlation itself and the methodology: the validity of developing models over such a large area using using spatially and categorically coarse datasets.

Report Overview

The study report has a simple structure. We first describe the project setting, including its natural and historical contexts (Chapter II). Next, we discuss how analytical units were divided out of the study area as a whole (Chapter III). Chapter IV is an exposition of the study methods. Chapter V presents the bulk of the study results, followed by discussion and closing comments (Chapter VI).

II. MODEL BUILDING: A BACKGROUND

Although the study goals are not anthropological entirely, our ideas about how best to produce a "forecast" of where one was most likely to find archaeological sites derived from the anthropology of the Great Basin. Anthropology – the study of man – has always been closely tied to archaeology in the Great Basin. Our approach to model-building drew from the seminal work of Julian Steward, as did the work of many, many, other archaeologists in the region.

In this chapter, we present brief discussions of these major models. Relatively little of what we are doing here is new, novel, or untried. So, these short summaries inform as to why we took particular decisions in this research.

Environmental Models

Julian Steward laid the groundwork for much of the research done in the Great Basin subsequent to the publication of his seminal work *Basin-Plateau Aboriginal Sociopolitical Groups (1938).* Researchers used the results of Steward's ethnographic reports as springboards to study the environment as a limiting factor in the level of cultural complexity attained by people in semi-arid landscapes. Limited resources in these areas would force the inhabitants to spend the majority of their time and effort procuring food and producing the technology required to aid in these tasks. Subsistence and settlement patterns could then be explained and explored in these terms. Steward's information provided many research topics and continues to be a valuable source of information for archaeologists.

Archaeologists quickly picked up from Steward the importance of pinyon nuts as a staple resource. Several studies examined whether the ethnographic reliance on pinyon had antiquity (Thomas 1971, 1973; Thomas and Bettinger 1976). Central Nevada studies showed that pinyon was, indeed, one of the long-term staples. This led to a focus on pinyon as the determinant of prehistoric settlement pattern.

More generally, Steward's work created a family of models that Wilde (1994) describes as paleoecological models, including several relating to the Great Basin. These include:

- Steward's ethnographic model discussed above which argued that the Great Basin had a "socially fragmenting effect upon its prehistoric inhabitants";

- Jenning's "Desert Culture" model based explicitly on Steward's work, originally set out to account for the record at Danger Cave in northwestern Utah and proposed a cultural ecological model in which a stable settlement and subsistence pattern was evidenced for the past 10,000 years;

- The Warner Valley model as delineated by Weide (1968) which is a lake and marsh-oriented pattern, but with increased reliance on upland faunal resources;

- O'Connell's Surprise Valley model with early and later variants. The early period (6500-4500 B.P.) was based primarily on marsh and grassland resources supplemented by upland animals during the winter; and,

- The Steens Mountain Model which shows an inverse relationship between site frequency and site size, which suggests high resource productivity, allowed population aggregations (Wilde 1994:97-102).

For a period of about 15 to 20 years, the pinyon-centric model of aboriginal settlement was truly the dominant paleoecological model. Because pine nuts are easily harvested and give a rich return, their absence can be predicted up to two years in advance, and their presence at least predictable in location, they were given primacy in many of the models of Great Basin prehistory. However, further archaeological work showed that the pinyon-centric model of aboriginal subsistence and settlement was too narrow. Other natural settings in the Great Basin, especially wetland and lacustrine environments, have long and rich archaeological records too. Resources in these settings are not so easily understood as pinyon nuts. For instance, why would one gather cattail pollen instead of harvesting pinyon nuts? Was this an alternative subsistence strategy or equal to "king pinyon"? Exploration of these questions brought anthropologists and archaeologists in to a consideration of caloric maximization in patchy environments: optimal foraging theory. Optimizing theory attempts to understand, and thus predict, the choices that a rational forager will make.

Optimizing models have been very successful as a deductive form of environmental model. Many studies in the relatively stark Great Basin have used models of what foragers *should have done* as rational behavior. These studies then examine whether the archaeological record matches the predicted behavior. Generally, such studies have been successful over areas of about half a million acres, such as a typical basin and range valley (Bonstead 2000; Connolly 1999; Gehr 1980; Jones et al. 2002; Mehringer 1986; Nials 1999, 2000; Pendleton 1979; Pettigrew 1984; Pinson 1999; Thomas 1971).

In the central Great Basin, the primary GIS optimal foraging models for the Great Basin have been proposed by Zeanah et al. (1995), Zeanah (in press), and Raven and Elston (1989). Beck and Jones (2000) provide a thoughtful overview of how these efforts fit within contemporary regional research directions. Optimal foraging approaches are not without problems. One of the main criticisms of the use of these models is that they are not easily replicated. Though they go far in description, they offer little in explanation outside of resource return rates in the form of calories expended and/or gathered per hour. Optimal models provide detailed formulas for energy return rates, but do not account for resources used in other contexts such as medicine, ritual, fuel, or shelter.

Overall, then, the history of inquiry in Great Basin archaeology has gone from informal paleoenvironmental models to ever more detailed and quantitative approaches. The latter methodologies, especially optimal foraging, provide numeric baselines from which to understand prehistoric settlement patterns.

Geomorphic Approaches

A geomorphic site preservation approach has been applied to archaeological studies in the Great Basin. This model developed and refined by Nials (1999; 2000) uses geomorphic principles to identify areas likely to retain in situ cultural materials. Suitable locations include those lying on and adjacent to:

- Late shorelines of pluvial lakes, including dunes contemporary with late pluvial lake shorelines;
- Distributary drainages entering open basins;
- Upland valley bottoms where stream gradient locally flattens out and the valley widens;
- Near springs active at the appropriate times and;
- Rockshelter and caves (Nials 1999).

This approach contains some tautological assumptions pointed out by Nials (personal communication; 2002) that make it problematic for elucidating patterns in the archaeological record. The geomorphic model promotes the survey of landforms that are favorable for, and have a high probability of, containing intact sites. In other words, well-preserved sites are looked for in the exact environments in which they should be found. Whitley (2000) notes that cause and effect in the record become difficult to discern:

> For instance, correlating 97% of sites with floodplains is meaningless if 97% of the survey areas from which the data is derived occur on floodplains. . . it is assumed that geomorphological setting was a constraint on site locations for instance, yet it is rarely clear how important certain geologic structures were in comparison with the relationship to a permanent source of water. Secondly, it is unclear whether it is the geomorphological setting or the distance to water is important, if there is already a spatial correlation between the two. . .Whitley (2000:27).

Approaches to Model Formation

The analysis done for the GBRI project does not attempt to falsify other models but points to the fact that they may not be the best approaches for GBRI. Selectionist models and others that attempt to explain human behavior in terms of natural selection are based on biological principles of animal behavior. In many cases, applying that theoretical approach to model human behavior does not provide adequate explanations for social components of the system, though they do provide general descriptive frameworks useful in explaining optimal utilization within broad environments. Perfect information about

people's environment is rarely available, "which means that they never really forage optimally, but base decisions on their best guesses" (Kelly 1995:100). Optimal models work well in small, delimited areas, but would not be practical to derive for the 20 million acres under consideration for the GBRI project area, which covers parts of three states in different topographic and environmental settings.

Because the units of analyses are hydrographic units (HUC) explored in a Geographic Information System (GIS) environment, the next section provides a very basic discussion of the premises of GIS. GIS will be used in the plural when referred to in a general sense, as there are many GIS programs, and in the singular when used in reference to the results of this particular project, as the final models were built using one particular product, ArcView® version 3.3.

III. STUDY AREA DEFINITION

The study area occupies the north-central portion of the Great Basin physiographic province and straddles the states of Nevada, Utah, and Idaho (Figure 3.1). After accessing data quality and completeness of GIS and database files for the region, a final configuration, consisting of 12 hydrographic basins was decided upon (Table 3.1) Hydrographic unit boundaries are derived from United States Geological Survey data, compiled from 1:250,000 base maps in 1973. The study area encompasses an excellent cross-section of the Great Basin biome, though a small portion of the area lies outside of the Great Basin as a hydrographic entity (Figure 3.2). For the sake of simplicity, we have used the common abbreviation of "HUC" (hydrologic unit catalog) in much of the following reporting to mean an individual hydrologic unit catalog item, i.e., a hydrographic basin.

Our initial attempt at model development proposed that we employ broad, landscape level criteria to model the probability of encountering cultural resources over the broad reach of the entire study area. While grossly similar in terms of very general climate, vegetation, and topography, considerable variation is apparent as one moves from west to east and south to north across the study area. When contrasted by size, landform, and hydrologic regimes, the valleys in eastern Nevada bear little resemblance to either the Great Salt Lake basin, or the Upper Snake area. In order to maintain the landscape level approach but constrain environmental factors, the sub-basins within the study area were chosen as the analytical units rather than the larger study area as a whole.

Variations in topography define three hydrographic sub-regions within the study area; the Central Nevada Desert, Great Salt Lake and the Upper Snake. Each sub-region consists of a number of smaller hydrographic units, with boundaries based upon drainage patterns. Gross similarities in topography and drainage pattern and vegetation allowed for analysis of the Upper Snake and Great Salt Lake sub-regions as single units.

Internally drained basins and surrounding mountain ranges comprise the Central Nevada Desert sub-region. While grossly similar, each hydrographical basin within this sub-region contains significant variation in physiography that could effect human adaptation. Two hydrographic units in Nevada, Long/Ruby Valley and Spring/Steptoe Valley were treated separately so that we might better highlight variation between each area, and directly compare the results of this landscape modeling effort with more fine-grained modeling recently conducted in the Nevada basins of Pine Valley and Railroad Valley. The Pilot-Thousand Springs hydrographic unit within the Great Salt Lake sub-region showed a closer affinity to Central Nevada units and was likewise analyzed as a distinct entity.

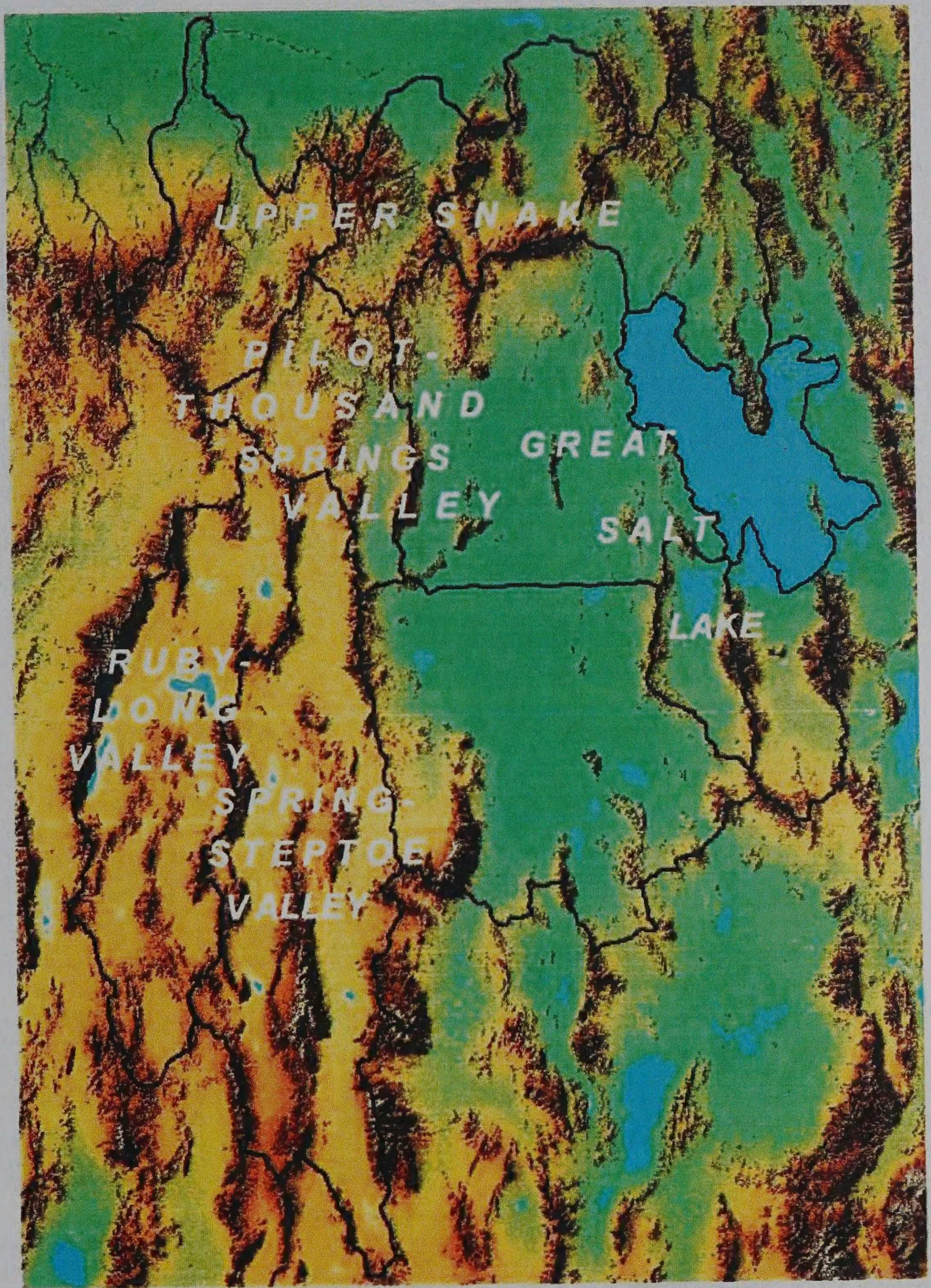

Figure 3.1 Study Area Boundary

20 0 20 40 Miles

40 0 40 80 Kilometers

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Table 3.1
Great Basin Restoration Initiative Analytic Units

HYROGRAPHIC UNIT NAME	SUBREGION	HUC CODE	ACRES	HECTARES
Salmon Falls, Idaho-Nevada	Upper Snake	17040213	1378940	558040
Raft. Idaho, Utah	Upper Snake	17040210	950560	384680
Goose, Idaho-Nevada-Utah	Upper Snake	17040211	743320	300810
Curlew Valley, Idaho, Utah	Great Salt Lake	16020309	1257780	509010
Northern Great Salt Lake Desert, Nevada	Great Salt Lake	16020308	3007640	1217160
Pilot-Thousand Springs, Nevada, Utah	Great Salt Lake	16020307	1142250	462250
Great Salt Lake, Utah	Great Salt Lake	16020310	1211150	490140
Long-Ruby Valleys, Nevada	Central Nevada Desert Basin	16060007	2620830	1060610
Spring-Steptoe Valleys, Nevada	Central Nevada Desert Basin	16060008	3406880	1378720
Rush-Tooele Valleys, Utah	Great Salt Lake	16020304	770360	311750
Skull Valley, Utah	Great Salt Lake	16020305	518240	209720
Southern Great Salt Lake Desert, Nevada-Utah	Great Salt Lake	16020306	3525770	1426830
		TOTAL	20533700	8309730

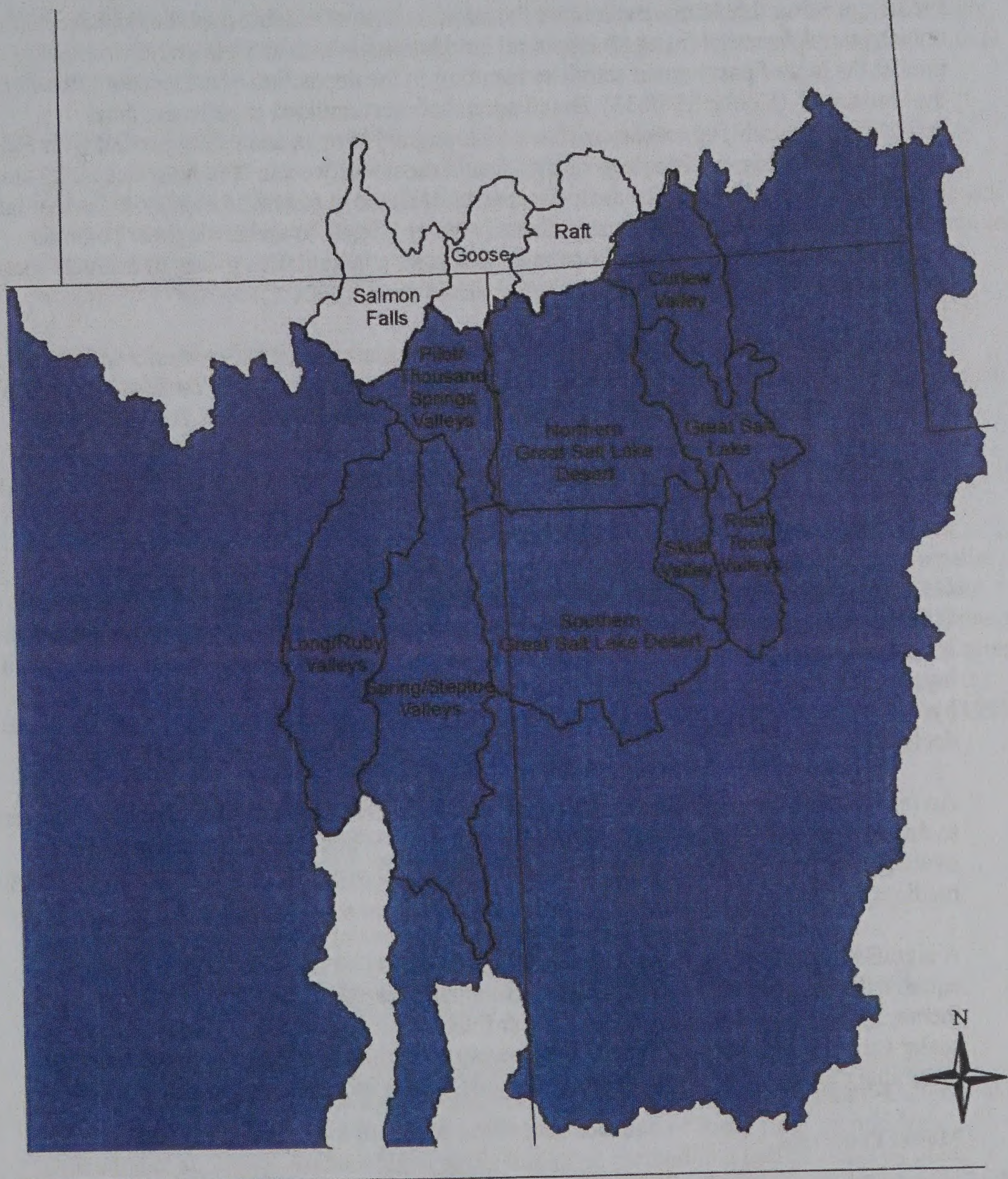


Figure 3.2 Great Basin Extent

Great Basin Hydrographic Boundary

Study Area

30 0 30 60 Miles

40 0 40 80 Kilometers

IV. METHODS AND PROCEDURES

Predictive cultural resource models are "a simplified set of testable hypotheses, based either on behavioral assumptions or on empirical correlations, which at a minimum attempts to predict the loci of past human activities resulting in the deposition of artifacts or alteration of the landscape" (Kohler 1988:33). Based upon their accumulated experience, most archaeologists could, on cursory review of a topographic map, accurately predict with 50% to 80% accuracy where archaeological sites would most likely occur. Predictive capacity alone, however, fails to meet the explanatory capacity of rigorous scientific inquiry. Sites that fall outside of the predictive pattern are often of greater interest to archaeologists. To better understand and evaluate outliers, one must first have a quantitative means to evaluate those sites that fall within a "normal" distribution (Heidelberg (2001:6).

As many as four approaches have been employed as a means identify patterns within predictive layers: *inductive, deductive, intersecting*, and *weighted*. The *inductive* approach establishes conclusions based upon data that has already been collected. It is widely used because it draws from an accumulation of survey and data collection compiled by various agencies and researches within a specific region. Biases are inherent due to variable survey strategies, sampling criteria and vagaries in data collection methods. Nonetheless, benefits are derived reduced costs from utilizing existing data.

Deductive pattern identification is derived from data specifically collected for the purpose of the study. Sampling strategies are controlled and data collection is consistent throughout the model area allowing negative findings to be more readily assessed. Additional background layers consisting of regionally specific data on vegetation, elevation, slope, aspect, soils, hydrology, and climate can be used to test deductive hypotheses regarding human land use decisions.

An *intersecting* approach combines deductive or inductive data sets with background layers to define probability within each environmental layer. When several probability zones overlap, their intersection defines an area of high sensitivity, with fewer overlaps defining medium and lower sensitivity zones.

A significant problem with the *intersecting* approach is that all variables are considered equally. To counter that shortcoming, environmental variables can be *weighted* so that a theme, such as aspect, is considered a lower relative value than say, distance to water. A scalar variable may also distinguish relative values within each environmental class. Combining *intersecting* and *weighting* methods creates an even more robust approach.

Model Processes

Determining which environmental and cultural variables and how those variables would be analyzed was a major consideration for the development of the planning model. Initial test runs with a limited data set from northeastern Nevada utilized chi-square analysis to determine the distributional relationship of sites to distinct environmental zones. The process required extensive manipulation of tabular and grid data sets then subsequent overlay of

predictive themes to produce a generalized sensitivity map. Updates and model testing utilizing this method would require continued technical expertise, thus reducing the overall utility of the model as a planning tool. A more economic approach to modeling was sought, in which new data could be easily input and new models generated in response to additional information.

A weights-of-evidence software package, *Spatial Data Modeler* (Kemp et al. 1999), was recently developed to run with the ArcView® *Spatial Analyst* extension (ESRI, Redlands, CA). It integrates a number of not-dissimilar steps used in the initial chi-square analysis and showed promise as a user-friendly, programmatic approach to developing a predictive model. To test its reliability and to better understand the modeling program, we contrasted the weights-of evidence results with a cell based chi-square analysis.

Spatial Data Modeler (SDM) is an *ArcView®* extension developed by the United States Geological Survey for mineral exploration purposes. SDM has several options for exploring data including: weights of evidence (WofE), logistical regression, fuzzy logic, and neural networks. Weights of evidence is particularly useful in predicting mineral deposits based upon the location of known resources and archaeologists have successfully applied the application to predict the probability of site locations.

Weights-of-evidence is a discrete multivariate method originally developed in a nonspatial context for combining a number of medical symptoms to predict disease (Bonham-Carter 1994; Xu et al. 1992). " *In this situation*, the response variable (presence/absence of disease) is binary and the predictor variables are also of the presence/absence type." (Bonham-Carter 1994:1). Assuming that the variables are not dependent, data sets are combined to give the posterior probability to each cell for each unique binary combination. Bonham-Carter (1998) explains this idea with the following example:

> If one wished to predict the likelihood of rain for a given day in an area that receives an average of 80 days of rain a year, a sound estimate of the prior probability of rain would be the ratio 80/365. This initial measure of probability can then be modified using other pieces of information to determine the probability that it will rain in a particular month depending on the month, the location of the jet stream, or any other factors. The factors determining the probability of rain will vary with the time of year and can be figured into the equation to produce a model that will answer: "what is the probability that it will rain tomorrow?" (Bonham-Carter 1998:302-303).

Weights-of evidence methods were adapted for use in mineral exploration by overlaying geologic and geochemical data sets to predict locations of ore bodies (Bonham-Carter et al. 1988; Raines 1999), and as a means to predict the location of fossil pack rat middens (Mensing et al. 2000). Archaeologist apply this same method in a spatial sense by using archaeological sites in an area as training points to create a probability map which aids in the prediction of locations likely to contain sites in the area under study. Results can be used for numerous purposes but, most recently, have been used by Federal agencies to better manage public lands.

The Bayesian weights-of-evidence approach requires a set of *training points*, in this case; archaeological sites, a set of *evidential themes* or variables that are assumed to be predictive of training point location, and a spatially defined study area. Training points are then compared with the evidential themes to calculate a *weight* assessing the spatial association between the points and each class within the theme. A positive weight indicates the class is present; a negative weight if the class is absent. The strength of a correlation is measured by its contrast (W^{+}-W^{-}). Positive contrast values suggest that more training points occur within that class than would be expected by chance. Negative contrasts indicate that fewer training points within that class than would be expected by chance. The contrast is divided by the standard deviation of the contrast values to provide a normalized (Student) contrast for each class.

Positive contrast values are grouped to assess the relative strength of the predictive pattern for each class (Table 4.1). Depending upon contrast values, the user determines which classes are "inside" (predictive) or "outside" (not predictive) within each evidential theme. By determining high or low cutoff points, the user's decisions directly influence the model outcome. In addition, expert opinion can be used to weight an individual class of data thought to be intrinsically more important, or to discard contrasts that are artificially high as a result of disproportionate unit area to training point values.

Prior to running the model, the program calculates a *prior probability* assuming a random distribution of sites:

$$\text{Prior Probability} = \frac{\text{Number of training points}}{\text{Total of study area units}}$$

Since the training points make up a very small sample of the entire study area, prior probability will likely be a number much smaller than the actual density of sites within the study area. After weights have been calculated and re-classified into a binary evidentiary theme, they are combined to create a *response theme* that calculates a *posterior probability* for all cells within each unique group of binary combinations. Posterior probabilities that are higher than the prior probability suggests a non-random distribution within that intersection of evidential themes.

Information Collection and Evidential Datasets

Background data used to analyze cultural and landscape features for the planning model were acquired from a number of different sources. The challenge with both the cultural and landscape data sets was to locate evidential themes that could be applied or adapted to the larger study area. In some cases (e.g. geology), consistent data was available for one state, but missing from others. Scale was also considered, especially for layers like vegetation, where detailed regional coverages lacked comparability between analytic units.

Table 4.1
Relative Strength of Contrast Value in Weights of Evidence Analysis (after Bonham-Carter; 1994)

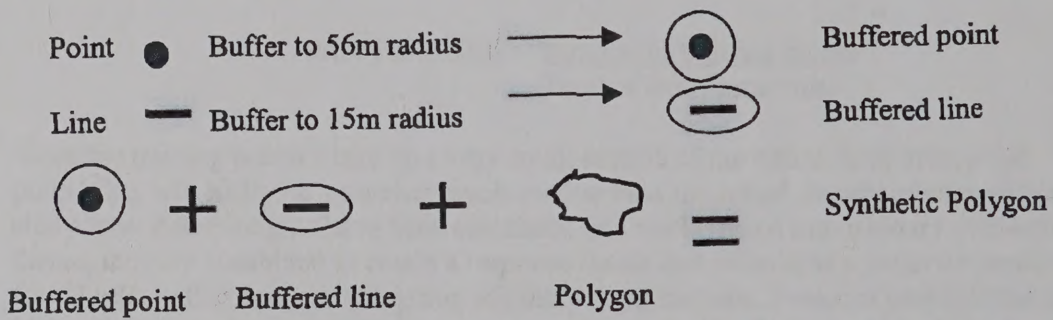
Contrast Value	Strength
0 to 0.5	Mildly Predictive
0.5 to 1.0	Moderately Predictive
1.0 to 2.0	Strongly Predictive
> 2.0	Extremely Predictive

Cultural Resources and Inventories

Cultural resource layers compiled for the analysis were derived from a number of different sources and required varying degrees of manipulation in order to maximize their utility. Idaho and Utah have developed and maintained a geographic information system for cultural resources. Both states graciously supplied that information for the project area. Nevada is in the process of completing a similar conversion to an electronic archive. As different cultural data sets were received, data was merged into a consistent format. All GIS data sets were converted from their default projections to a uniform UTM Zone 11, NAD 1927 projection.

Utah

Cultural resource shapefiles and resource inventory shapefiles were provided by the Utah State Historic Preservation Office. Depending upon relative size of the feature, site and inventory locations are displayed as point, line or polygon shapes. For analytical purposes, points and lines were buffered to create synthetic polygons and then merged with the appropriate (site or inventory) polygon layers to create single polygonal site or inventory layers. Attributes for the Utah synthetic shapes included buffered width, area, site or inventory number, confidence in plot location, and data entry specifics. Using *ArcView*® utilities, a center point was created for each site so that each entity could also be displayed as a single point.



The Utah site database consisted of a *Microsoft Access*® database containing Intermountain Antiquities Computer System (IMACS) encoded fields. Site numbers in the IMACS database allowed the data to be linked to the GIS site shapefiles.

Idaho

The Idaho State Historic Preservation Office provided a *Microsoft Access*® database containing UTM coordinates for each site within the project area. Fields pertaining to a range of feature types are present in the table structure, and descriptive artifact attributes are annotated for each site. A separate table containing SHPO National Register status was provided with the site data. Inventory databases with locational information have not been compiled for Idaho.

Using the Idaho site UTM coordinates, a point theme was created for each site for use in the GIS. Attribute tables for the site points contained all tabular data presented in the Idaho database. As quarter section data in the inventory database was inconsistent, an attempt to determine inventory extent based upon legal descriptions proved futile. Composite legal descriptions often produced areas significantly larger than the reported inventory extent, making the data unreliable.

Nevada

Nevada SHPO maintains site and inventory archives at the Nevada State Museum for its northern counties, and at the University of Nevada, Las Vegas, Harry Reed Center for Environmental Studies for southern counties. Archival data is currently in the process of being converted to an electronic database and GIS format. Site and inventory data for Elko County was previously entered into the statewide GIS, and into a *Microsoft Access®* database. The database contains fields and codes identical to the IMACS site record. Spatial and database information for sites and inventories lying within the White Pine county and Lincoln county portions of the study area were compiled as part of this project.

Several steps were involved in data compilation for the study area within Lincoln and White Pine counties. First, archival USGS maps (7.5 and 15 minute quadrangles) containing site and inventory locations were scanned at the UNLV Harry Reid Center archive. Those quads were then geo-referenced to UTM Zone 11; NAD 27 coordinates. Each site and inventory marked on the maps was digitized. Any sites smaller than 2.5 acres in extent were digitized as point features using GIS software; linear sites were digitized as lines; all other sites were represented as polygons. Similar digitizing rules were applied to inventoried areas. Site and inventory metadata consisting of map source, entry dates and accuracy or error flags were appended to attribute tables for each shape.

Site data from records predating IMACS (1982) proved to be somewhat inconsistent. Likewise, early investigations are generally less complete than more recent ones and the survey methods used at the time varied considerably. To control for variability in survey method and site reporting, assemblage and administrative site data were entered only for those sites occurring within inventories with a cumulative extent greater than 640 acres. Size criteria assured relatively uniform reconnaissance and reporting technique and constrained site vs. non-site analysis of the landscape within consistent parameters.

Sites were selected by intersecting inventory area with site location. Site records were assembled from archives at the BLM Ely Field Office, UNLV Harry Reid Center and the Nevada State Museum. Administrative and assemblage data were compiled in an *Microsoft Access®* database using the IMACS encoding format, then linked to the spatial data in the GIS attribute tables. Like the Utah data, shapefiles were transformed into a single polygon layer by buffering points and lines into a synthetic polygon shape, then merging those with the existing polygon shapefile for analytical purposes. Site centerpoints were also calculated for each feature for use if point analysis was required.

Study Area Data Files

After site data from all three states were assembled, GIS shapefiles were merged into a single analytical theme and joined to respective site assemblage data. Since assemblage data was reported in slightly different format for each state, attribute fields were reformatted to indicate presence or absence of specific artifact types or general classes, feature types, and temporal affiliation. The resulting table produced comparable data attributes for all site records. It was used to identify historic and prehistoric site affinity and created a baseline for archaeological and anthropological site analysis. Figure 4.1 depicts the distribution of site center points across the study area. Inventories greater than 640 acres are shown within the Nevada and Utah data set.

Evidential Themes

Landscape level analysis required the compilation of a number of environmental data sets or evidential themes that could be used with the site data to construct a probability model. Data sets compiled for the project area included slope, vegetation, landform, and hydrology. A roads layer was compiled for historic resource analysis. GIS layers pertaining to potential marsh habitat were also derived as a means to address research questions relating to prehistoric land use.

Slope

Slope was derived from the USGS National Elevational Data set (NED). The 30 meter NED was clipped to each analytical unit within the project area and slope was calculated for each cell, and then converted to a slope grid. For analytical purposes, slope was divided into five classes: 0-5 degrees, 5-15 degrees, 15-30 degrees, 30-45 degrees and greater than 45 degrees. The NED was also used to create shaded relief maps for use as background graphic in each of the analytic units.

Vegetation

Vegetation layers were derived from Fire Sciences Laboratory, Rocky Mountain Research Station, Potential Natural Vegetation Groups (Schmidt et al. 2002). This is coarse-scale data that were developed as part of a national level, fire-planning model. Vegetation data was refined to match terrain using a 500 meter Digital Elevation Model, 4th Code Hydrological Units and Ecological Sub-regions (Bailey's Sections). Classifications follow Küchler (1975) descriptions for ECO Region 4 (Table 4.2).

Landform

In order to derive a general characterization of landform within each analytic unit, the NED data set was reclassified into three ranges of slope that roughly approximate flats, piedmont and mountainous areas. Flats comprise all slopes between 0 and 3%; piedmont lies between 4 and 10%; and mountains are all slopes above 10%. The resulting classes approximate elevational rings of valley bottom, alluvial fan and upland slopes for each analytic unit.

Figure 4.1 Sites and Inventories

Study Area Boundary
Inventories
Sites

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Table 4.2
Potential Natural Vegetation Groups ECO Region 4 (after Küchler; 1975)

Code	Description	ECO Code	Communities
2	Great Basin Pine	K022	Great Basin Pine Forest
22	Juniper/Pinyon	K023	Juniper-pinyon woodland
23	Juniper Sagebrush	K024	Juniper steppe woodland
25	Sagebrush	K038	Great Basin sagebrush
		K055	Sagebrush steppe
26	Chaparral	K037	Mountain mahogany-oak scrub
28	Desert Shrub	K039	Blackbrush
		K040	Saltbrush-greasewood
		K046	Desert: vegetation largely absent
36	Wet Grassland	K049	Tule marshes
37	Barren	K052	Alpine meadows and barren

Springs and Streams

A hydrologic layer consisting of springs and streams was compiled for each of the analytic units. Source data was derived from *USGS 1:100,000 Digital Line Graphs (DLG)* clipped to the project area then buffered at intervals of 200, 400, 1000 and 2000 meters. Buffered shapes were then converted into grids for each analytic unit. Both intermittent and perennial stream classes are included in the data set, since present intermittent water courses may have been more productive prehistorically.

Potential Wetlands

The extent of potential marsh habitat was derived from the U.S. Soil Conservation Service STATSGO State Soil Geographic database. The STATSGO database was designed for use as a regional, multi-state resource planning, management and monitoring tool. Soil data is derived from generalized information provided in the county-wide soils database and extrapolated to 1:250,000 scale USGS quadrangles. STATSGO data sets include fields relating to soil class, structure, texture, engineering capabilities, suitability for agriculture, and potential for various rangeland habitat types. STATSGO databases were queried for soils with the potential to sustain wetland plants and the potential to sustain wetland wildlife. The results were used as a proxy for potential wetlands. Those shapes were then buffered at 1000, 3000 and 5000 meter intervals for analytical purposes and then converted to grids.

Roads

The roads layer was extracted from U.S. Census Bureau 2000 *Tiger*/line files. Data was derived from a generalized 1:100,000 base layer. Line data was then buffered to 200, 400, and 1000 meter widths for analytic purposes.

Analytic Methods

Cultural resource inventory data sets allowed for multiple approaches be used to construct a management model. Inventoried areas provided a controlled setting where both site and non-site data can be assessed. Within the site/non-site parameters chi-square analysis could also be conducted to validate predictive patterns observed in the calculated weights tables.

Weights tables were compiled in *Spatial Data Modeler* using sites within inventoried areas as a training point theme and inventory extent as a mask over all evidential themes. Unit area settings suggested by *Spatial Data Modeler* vary according to analytic unit size. The suggested unit area compensates for variation between study area cell size and output cell size of the evidential themes (Suggested Value= (total Study Area / total Training Points) / 40). Default settings for most of the analytic units ranged from 0.20 to 0.30 square kilometers (447.2 or 547.7 meter grid). To maintain consistency within each analytic unit, the unit area was arbitrarily set to 500 meter cells (0.25 square kilometers). Multiple training points within a cell greatly inflate prior probabilities since probability is evaluated as a deviation from the normal distribution of one training point per unit area. SDM will automatically *weed* or

remove any duplicate training points within a cell so that there are no more than one training point (site) per unit area.

Once unit area and training point parameters are set, *Spatial Data Modeler* calculates a weight table for each evidential theme. The resulting contrasts (weight $^{+}$ - weight^{-}) indicate the relative strength of each predictive class.

To test the efficacy of the weights calculations and to aid in the selection of predictive classes for creation of a final response theme, a chi-square test was run with the inventoried site data set against the evidential themes. To create a site/non-site matrix, the project area was arbitrarily gridded into 250 meter square cells and a centerpoint was calculated for each cell. Centerpoints were clipped to the analytic unit, then again clipped so that only grid points within inventoried areas remained. Using *ArcView® Spatial Analyst*, any grid point within 100 meters of a site polygon was selected and saved as a site training point. The selected subset was switched, and all remaining grid points were saved as a non-site theme (Figure 4.2).

With the *Spatial Data Modeler* area unit set to 250 meter cell size, weights were calculated using both site and non-site training point themes. Resulting contrasts were compared with the previous run of weeded, inventoried sites. Classes with the highest contrasts in both the 250 meter grid site and weeded site weights tables were chosen for validation using the chi-square test. Evidential class with the highest contrast was tabulated against site and non-site occurrences (Table 4.3). A chi-square above 3.84 was considered significant at 1df. If chi-square testing confirmed the contrast as predictive, that class was chosen as "inside" the pattern.

Response themes, using all sites (weeded) within each analytic unit, and the predictive classes were then run for each of the hydrographic units that contained inventory themes. The normalized posterior probability was then reclassified to reflect high, moderate and low probability of site occurrence. Summary tables of sites within each probability zone were compared with the results from areas of previous inventory. The probability model was considered accurate if highest site frequencies were associated with areas of high and moderate probability. Since the Idaho data lacks spatial data for inventories, the comparisons allowed us to assess the feasibility of using site center points regardless of inventory status as valid training points for pattern prediction.

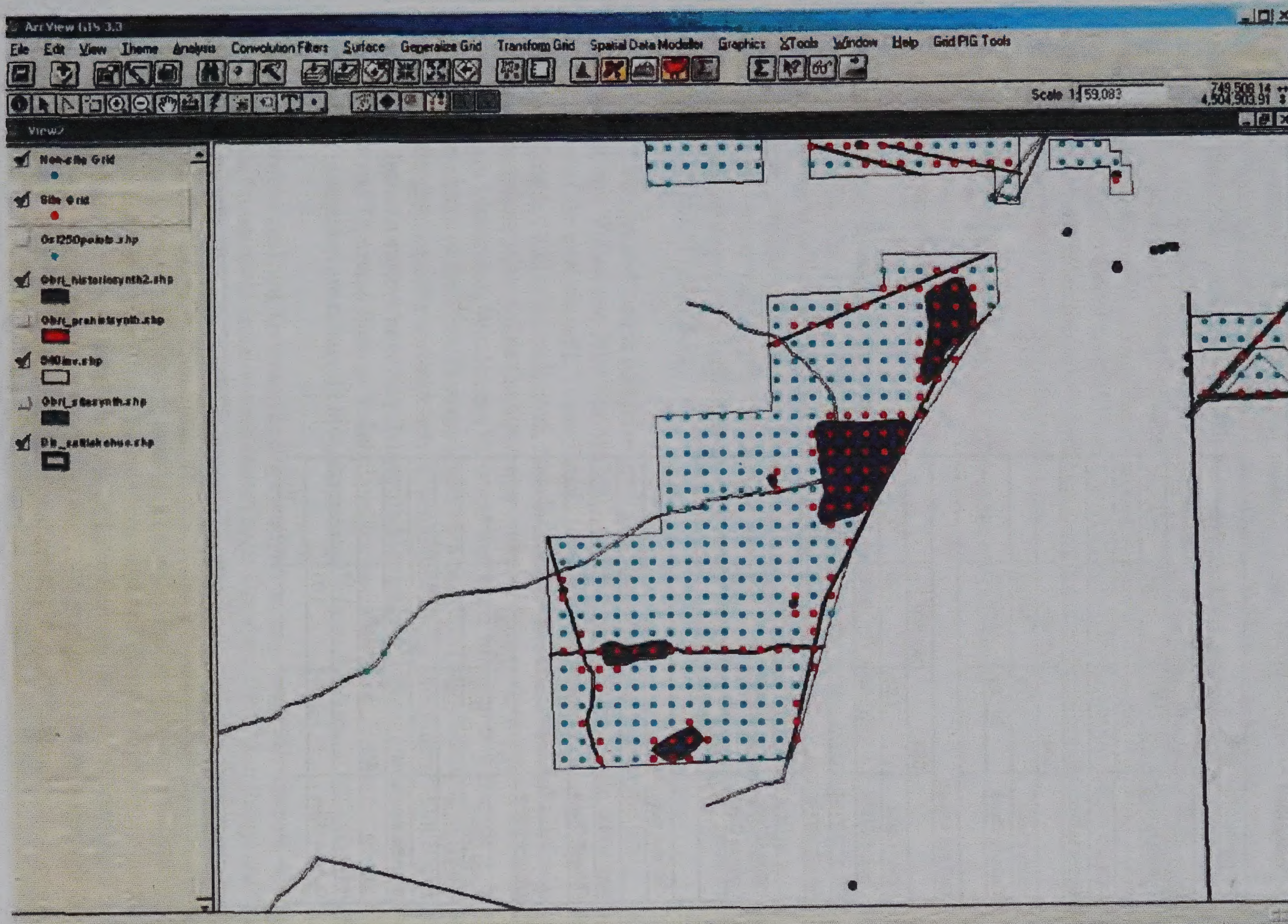


Figure 4.2 250m Grided Centerpoints

Table 4.3
Chi-Square Analytic Format

Points on 250m grid			
	Site	Not Site	ROW
Inside Class	33	740	773.00
Outside Class	510	15474	15984.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
Inside Class	25.05	747.95	
Outside Class	517.95	15466.05	
Cell chi values			
	Site	Not Site	
Inside Class	7.95	-7.95	
Outside Class	-7.95	7.95	
Chi-squares			
	Site	Not Site	
Inside Class	2.52	0.08	
Outside Class	0.12	0.00	
2.73	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
Inside Class	1.59	-0.29	
Outside Class	-0.35	0.06	
Cell variance			
	Site	Not Site	
Inside Class	0.92	0.03	
Outside Class	0.04	0.00	
Adj. std. residuals			
	Site	Not Site	
Inside Class	1.65	-1.65	
Outside Class	-1.65	1.65	
			0.00

V. ANALYSIS

Of the 83,000 square kilometers within the study area, 78,747 square kilometers were evaluated as part of the probability model; 4350 square kilometers of land in the Upper Snake analytic unit not under Bureau of Land Management control were excluded. (Table 5.1) Systematic inventories have been conducted over approximately 4% of the model, and inventories greater than 640 acres in extent comprise 80% of that area. A total of 5284 sites are reported within the model area, 1819 of them fall within the larger inventory blocks. The following chapter describes respective hydrologic units and presents results of the probability model for each analytic unit within the model area.

PILOT/THOUSAND SPRINGS VALLEY ANALYTIC UNIT

Analytic Unit Description

The Pilot Springs/Thousand Springs analytic unit covers approximately 1.1 million acres (1785 mi^2)/.4 million hectares (4623 km^2). It lies in within the northeastern corner of Nevada with a small portion falling within western Utah. The analytic unit lies within the Great Basin region, but with drainage eastward into the Great Salt Lake Desert and Bonneville Basin is considered a sub-unit of the Great Salt Lake hydrographic unit. The upland characterization of this analytic unit drove the decision to analyze it separately from the larger Great Salt Lake analytical unit. (Figure 5.1)

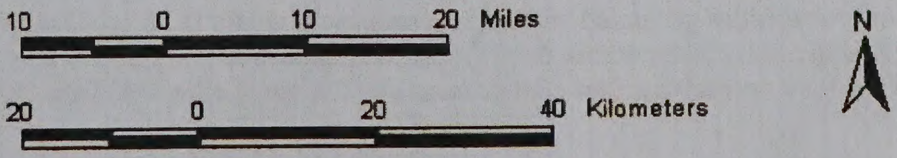
Several small valleys and basins comprise the Pilot/Thousand Springs analytic unit. Thousand Springs Valley and Pilot Springs Valley are the most predominate, covering a major portion of the analytic unit. Toano Draw slopes northward into Thousand Springs Valley and Tecoma Valley extends north from Pilot Springs Valley. A number of relatively low ranges and mountains define the limits and interior of the analytic unit. The Toano Range, Pequop Mountains, Windemere Hills and the Snake Mountains define the southwestern extent of the Pilot/Thousand Springs area. Knoll Mountain and Cedar Mountain mark the hydrographic units northern extent, while the Delano Mountains, Pilot Range, and Leppy Hills form an eastern boundary. Ninemile Mountain and Murdock Mountain separate Toano Draw and Thousand Springs Valley from the eastern valleys. Elevations of the surrounding mountains are relatively low, extending between 2200 and 2700 meters amsl.

All valleys within the Pilot/Thousand Springs analytic unit are externally drained. Thousand Springs Creek Flows north and eastward from Toano Draw and the Snake Range around Ninemile Mountain, then southeasterly through Tecoma Valley into the northwestern uplands of the Great Salt Lake Desert. Pilot Springs Creek drains southward through Pilot Springs Valley then terminates in an extensive sand sheet and dry flat between the southern extent of the Pilot Range and the Leppy Hills. The southern extent of Pilot Springs Valley lies at 1340 meters amsl, just above the Gilbert Shoreline of Lake Bonneville. Toano Draw and Thousand Springs Valley lie at elevations between 1800 and 1600 meters. As it drains through Tecoma Valley, Thousand Springs Creek attains an elevation of 1400 meters amsl.

Table 5.1
Summary Sites and Inventories Within Each Analytic Unit

Analytic Unit	Model Area (sq km)	Total # Inventories	Inventory Area (km sq)	% Inventory	# 640+ Acre Inventories	640+ Inventory Area (km sq)	% Inventory Sampled	Total # Sites	# Inventoried Sites
Pilot/Thousand Springs Valley	4,623	118	192	4.2%	14	164	85.6%	697	460
Ruby/Long Valley	10,606	357	1050	9.9%	60	928	88.3%	973	638
Spring/Steptoe Valley	13,787	410	621	4.5%	64	387	62.4%	823	410
Great Salt Lake	41,646	911	1318	3.2%	75	1062	80.6%	1116	311
Snake	8,085	NA	NA	NA	NA	NA	NA	1675	NA
Total	78,747	1,796	3,181.54	4.0%	213	2,541.38	79.9%	5,284	1,819
(Snake Mask=4350km^2)	4,350								
GBRI Total	83,097								

Figure 5.1 Pilot/Thousand Springs Valley Analytic Unit



Vegetation within Pilot/Thousand Springs analytic unit is primarily sagebrush with juniper and juniper/pinyon forest on mountain slopes. Barren areas occur in the southern dunes and flats while desert shrub communities in the lower portions of Pilot Springs Valley and Tecoma Valley.

Analytic Results

Prehistoric Evidential Themes

Of the 4622 square kilometers within the Pilot/Thousand Springs Valley analytic unit approximately 3.5% (164 km^2) have been assessed by inventories larger than 640 acres. Four hundred sixty prehistoric sites are reported within those inventories, while 697 sites are reported within the analytic unit as a whole. (Table 5.2) (**Figure 5.2**)

Sampling within each of the evidential classes is relatively consistent. The juniper steppe vegetation zone is less than 1 square kilometer in extent and has not been sampled. Less than 2% of the juniper/pinyon zone has been inventoried. Areas lying more than 1000 meters from streams and between 3000 and 5000 meters from potential wetlands have also been poorly sampled.

Calculated weights for each evidential theme suggests that a predictive pattern for sites occurs within the desert shrub vegetative community, within 1000 meters of potential wetlands and within piedmont slopes.(Table 5.3) Positive contrasts for slope and distance to springs or streams are inconsistent across analytic runs, and calculated chi-squares suggest a normal distribution of sites within high contrast classes.

Within vegetation evidential themes, desert shrub is the only class with a high contrast. While 10% of the sites lie within the juniper/pinyon zone, distribution of sites is less than anticipated for a positive pattern association. (**Figure 5.3**)

Potential wetland areas within the Pilot/Thousand Springs analytic unit are relatively few, as reflected by the cumulative extent of those areas lying outside of the 5000 meters buffered area. Areal extents of the three buffered zones are approximately equal, and contrast is uniformly high and strongly predictive for the 0-1000 meter buffer. (**Figure 5.4**)

When only inventoried areas are considered, the piedmont is the most predictive class for sites. An analytic run using all sites identifies flats as the most predictive class, but by controlling for inventoried space, the number of sites within that area is reduced by almost 42%. By contrast, 78% of all sites within the piedmont landform are accounted for by inventories greater than 640 acres in extent. (**Figure 5.5**)

Prehistoric Predictive Response

Posterior probabilities generated within the response theme for the Pilot/Thousand Springs Valley analytic unit cluster within three groups with breaks at 0.072 and at 0.044. The prior probability for a normal distributional pattern is 0.029, well below the (Table 5.4) (**Figure**

Table 5.2
Pilot/Thousand Springs Valley Analytic Unit Inventory Summary

Potential Vegetation

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
22	Juniper/pinyon	1205.17	79	16.69	1.38%	48
23	Juniper steppe	0.66	0	0.00	0.00%	0
25	Sagebrush	2233.26	329	67.64	3.03%	197
28	Desert shrub	935.26	273	69.82	7.47%	212
62	Barren	201.78	16	10.01	4.96%	3
9999	Missing data	2.58	0	0.00	0.00%	0
-99	No data	43.84	0	0.00	0.00%	0
	Total	4622.54	697	164.16	3.55%	460

Streams and Springs

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	1808.87	304	70.36	3.89%	199
400	200-400m	1385.04	218	51.01	3.68%	142
1000	400-1000m	1343.00	172	42.55	3.17%	118
2000	1000-2000m	85.18	3	0.46	0.54%	1
9999	>2000m	0.45	0	0.00	0.00%	0
	Total	4622.54	697	164.38	3.56%	460

Potential Wetlands

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1000	0-1000m	551.16	154	14.27	2.59%	64
3000	1000-3000m	681.81	55	9.39	1.38%	31
5000	3000-5000m	573.13	29	5.63	0.98%	9
9999	>5000m	2813.13	459	135.09	4.80%	356
-99	No data	3.31	0	0.00	0.00%	0
	Total	4622.54	697	164.37	3.56%	460

Landform

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1	Flat	2108.33	434	108.66	5.16%	254
2	Piedmont	1416.82	178	30.82	2.17%	139
3	Mountain	1097.39	85	24.90	2.27%	67
	Total	4622.54	697.00	164.38	3.56%	460

Slope

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
0-5	degrees	3708.45	613	145.90	3.93%	398
5-15	degrees	855.56	81	17.19	2.01%	59
15-30	degrees	53.92	3	1.28	2.37%	3
30-45	degrees	0.28	0	0.01	3.15%	0
>45	degrees	0.01	0	0.00	25.00%	0
9999	Missing data	1.03	0	0.00	0.00%	0
-99	No data	3.31	0	0.00	0.00%	0
	Total	4622.54	697	164.37	3.56%	460

Summary Vegetation

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Juniper/pinyon	4124	1669	48	0.0116	1.16	85.92	0.0288	2.88	34.77
Juniper steppe	0	0	0	0.0000	0.0000	0.00	0.0000	0.0000	0.00
Sagebrush	16715	6764	197	0.0118	1.18	84.85	0.0291	2.91	34.34
Desert shrub	17252	6982	212	0.0123	1.23	81.38	0.0304	3.04	32.93
Barren	2474	1001	3	0.0012	0.12	824.82	0.0030	0.30	333.79
Missing data	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
No data	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Total	40566	16416	460	0.0113	1.13	88.19	0.0280	2.80	35.69

Summary Water

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	17387	7036	199	0.0114	1.14	87.37	0.0283	2.83	35.36
200-400m	12605	5101	142	0.0113	1.13	88.77	0.0278	2.78	35.92
400-1000m	10513	4255	118	0.0112	1.12	89.10	0.0277	2.77	36.06
1000-2000m	114	46	1	0.0088	0.88	113.92	0.0217	2.17	46.10
>2000m	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Total	40619	16438	460	0.0113	1.13	88.30	0.0280	2.80	35.73

Summary Wetland

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	3527	1427	64	0.0181	1.81	55.11	0.0448	4.48	22.30
1000-3000m	2319	939	31	0.0134	1.34	74.82	0.0330	3.30	30.28
3000-5000m	1390	563	9	0.0065	0.65	154.48	0.0160	1.60	62.52
>5000m	33381	13509	356	0.0107	1.07	93.77	0.0264	2.64	37.95
No data	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Total	40618	16437	460	0.0113	1.13	88.30	0.0280	2.80	35.73

Summary Landform

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Flat	26850	10866	254	0.0095	0.95	105.71	0.0234	2.34	42.78
Piedmont	7616	3082	139	0.0183	1.83	54.79	0.0451	4.51	22.17
Mountain	6153	2490	67	0.0109	1.09	91.84	0.0269	2.69	37.17
Total	40619	16438	460	0.0113	1.13	88.30	0.0280	2.80	35.73

Summary Slope

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-5°	36052	14590	398	0.0110	1.10	90.58	0.0273	2.73	36.66
5-15°	4247	1719	59	0.0139	1.39	71.99	0.0343	3.43	29.13
15-30°	316	128	3	0.0095	0.95	105.45	0.0234	2.34	42.67
30-45°	2	1	0	0.0000	0.00	0.00	0.0000	0.00	0.00
>45°	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Missing data	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
No data	0	0	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Total	40618	16437	460	0.0113	1.13	88.30	0.0280	2.80	35.73

Roads (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	926.88	48	39.53	4.27%	11
400	200-400m	726.02	8	25.32	3.49%	2
600	400-600m	596.54	2	19.33	3.24%	0
800	600-800m	493.18	2	16.52	3.35%	1
1000	800-1000m	401.08	2	13.58	3.39%	1
9999	>1000m	1478.84	7	50.09	3.39%	4
	Total	4622.54	69	164.38	3.56%	19

Water (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	1808.87	32	70.36	3.89%	11
400	200-400m	1385.04	25	51.01	3.68%	6
1000	400-1000m	1343.00	11	42.55	3.17%	2
9999	>1000m	85.63	1	0.46	0.54%	0
	Total	4622.54	69	164.38	11.28%	19

Summary Inventoried Roads (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	9769	3953	11	0.0011	0.11	888.08	0.0028	0.28	359.39
200-400m	6257	2532	2	0.0003	0.03	3128.51	0.0008	0.08	1266.07
400-600m	4776	1933	0	0.0000	0.00	0.00	0.0000	0.00	0.00
600-800m	4082	1652	1	0.0002	0.02	4081.98	0.0006	0.06	1651.92
800-1000m	3356	1358	1	0.0003	0.03	3356.33	0.0007	0.07	1358.26
>1000m	12378	5009	4	0.0003	0.03	3094.61	0.0008	0.08	1252.34
Total	40619	16438	19	0.0005	0.05	2137.85	0.0012	0.12	865.16

Summary Water (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	17387	7036	11	0.0006	0.06	1580.62	0.0016	0.16	639.65
1000-3000m	12605	5101	6	0.0005	0.05	2100.83	0.0012	0.12	850.18
3000-5000m	10513	4255	2	0.0002	0.02	5256.73	0.0005	0.05	2127.33
>5000m	114	46	0	0.0000	0.00	0.00	0.0000	0.00	0.00
Total	40619	16438	19	0.0013	0.13	57076.28	0.0032	0.32	0.32

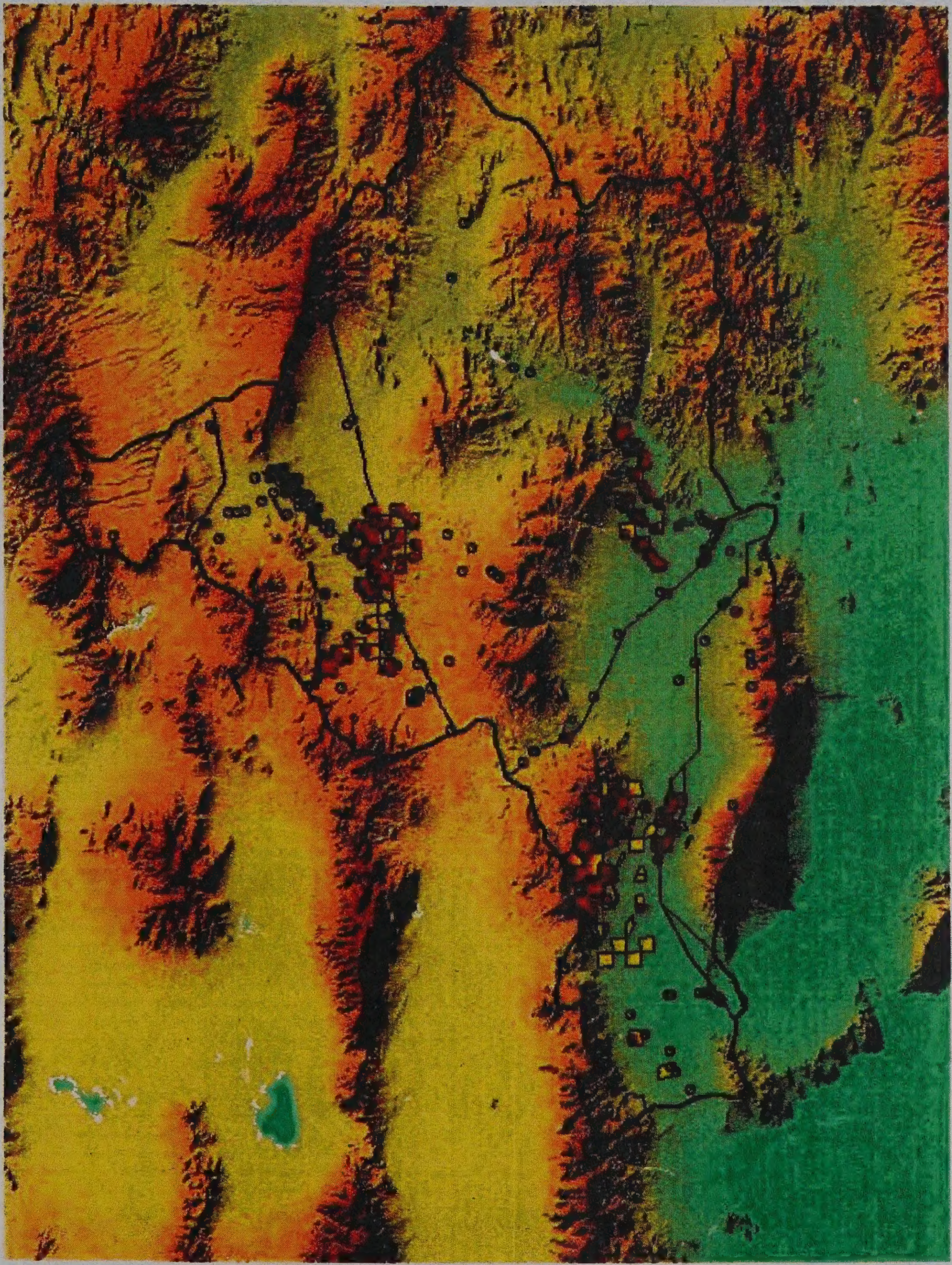


Figure 5.2 Pilot/Thousand Springs Valley Analytic Unit - Inventories and Prehistoric Sites

Pilot Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Inventories

10 0 10 20 Miles

20 0 20 40 Kilometers

N

Table 5.3
Pilot/Thousand Springs Valley Analytic Unit Prehistoric Evidential Theme Weights/Chi-Square

ALL SITES

Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
22	Juniper/pinyon	1205	4821	65	79	-0.8082	0.1845	-0.9927	0.1332	-7.45
23	Juniper steppe	1	3	0	0	0.0000	0.0000	0.0000	0.0000	0.00
25	Sagebrush	2233	8933	240	329	-0.1052	0.0913	-0.1965	0.0876	-2.24
28	Desert shrub	935	3741	226	273	0.7402	-0.3152	1.0554	0.0890	11.86
62	Barren	202	807	14	16	-0.5524	0.0196	-0.5721	0.2732	-2.09
9999	Missing data	3	10	0	0	0.0000	0.0000	0.0000	0.0000	0.00
-99	Missing data	44	175	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	4622		545	697					

Inventoried Potential Vegetation (weeded)

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
22	Juniper/pinyon	17	67	37	48	-0.0188	0.0021	-0.0209	0.2598	-0.08
23	Juniper steppe	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
25	Sagebrush	68	271	155	197	0.0568	-0.0396	0.0964	0.1599	0.60
28	Desert shrub	70	279	174	212	0.2659	-0.1910	0.4569	0.1608	2.84
62	Barren	10	40	1	3	-3.9016	0.1421	-4.0437	1.0160	-3.98
	Total	164		367	460					

Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
22	Juniper/pinyon	17	267	49	48	-0.1033	0.0113	-0.1146	0.1662	-0.69
23	Juniper steppe	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
25	Sagebrush	68	1082	205	197	-0.0644	0.0437	-0.1081	0.0998	-1.08
28	Desert shrub	70	1117	269	212	0.2412	-0.2038	0.4450	0.0981	4.54
62	Barren	10	160	1	3	-3.6808	0.0768	-3.7577	1.0043	-3.74
	Total	164		524	460					

Non Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
22	Juniper/pinyon	17	267	218	48	0.1697	-0.0182	0.1876	0.1659	1.13
23	Juniper steppe	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
25	Sagebrush	68	1082	879	197	0.1415	-0.0926	0.2342	0.0988	2.37
28	Desert shrub	70	1117	831	212	-0.2562	0.2172	-0.4733	0.0962	-4.92
62	Barren	10	160	146	3	1.0063	-0.0469	1.0533	0.2820	3.73
	Total	164		2074	460					

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	1809	7235	244	304	0.1466	-0.1062	0.2528	0.0877	2.88
400	200-400m	1385	5540	160	218	-0.0134	0.0057	-0.0191	0.0956	-0.20
1000	400-1000m	1343	5372	134	172	-0.1640	0.0605	-0.2244	0.1009	-2.22
2000	1000-2000m	85	341	3	3	-1.2217	0.0134	-1.2351	0.5816	-2.12
9999	>2000m	0	2	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	4622		541	697					

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	70	281	161	199	0.0565	-0.0420	0.0985	0.1589	0.62
400	200-400m	51	204	110	142	-0.0770	0.0348	-0.1118	0.1694	-0.66
1000	400-1000m	43	170	95	118	0.0002	-0.0001	0.0003	0.1793	0.00
2000	1000-2000m	1	2	1	1	-0.0641	0.0002	-0.0643	1.4802	-0.04
9999	>2000m	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		367	460					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	70	1126	231	199	0.0369	-0.0282	0.0651	0.0984	0.66
400	200-400m	51	816	167	142	0.0334	-0.0152	0.0486	0.1050	0.46
1000	400-1000m	43	681	126	118	-0.0911	0.0307	-0.1218	0.1136	-1.07
2000	1000-2000m	0	7	0	1	0.0000	0.0000	0.0000	0.0000	0.00
9999	>2000m	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		524	460					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	70	1126	877	199	-0.0656	0.0506	-0.1163	0.0964	-1.21
400	200-400m	51	816	645	142	0.0011	-0.0005	0.0016	0.1035	0.02
1000	400-1000m	43	681	551	118	0.1207	-0.0402	0.1609	0.1120	1.44
2000	1000-2000m	0	7	5	1	-0.5814	0.0019	-0.5833	0.7894	-0.74
9999	>2000m	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		2078	460					

Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	551	2205	93	154	0.3709	-0.0618	0.4327	0.1162	3.72
3000	1000-3000m	682	2727	49	55	-0.5075	0.0676	-0.5751	0.1512	-3.80
5000	3000-5000m	573	2293	24	29	-1.0553	0.0902	-1.1455	0.2100	-5.46
9999	>5000m	2813	11253	379	459	0.1370	-0.2564	0.3934	0.0943	4.17
-99	Missing data	3	13	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	4622		545	697					

Inventoried Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	14	57	42	64	0.7899	-0.0662	0.8561	0.3111	2.76
3000	1000-3000m	9	38	28	31	0.8425	-0.0460	0.8885	0.3834	2.32
5000	3000-5000m	6	23	6	9	-1.2457	0.0420	-1.2878	0.4834	-2.66
9999	>5000	135	540	291	356	-0.0793	0.3800	-0.4593	0.2119	-2.17
	Total	164		367	460					

Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	14	228	62	64	0.4040	-0.0436	0.4477	0.1575	2.84
3000	1000-3000m	9	150	26	31	-0.1726	0.0099	-0.1824	0.2214	-0.82
5000	3000-5000m	6	90	8	9	-0.9365	0.0243	-0.9609	0.3737	-2.57
9999	>5000m	135	2161	428	356	-0.0077	0.0350	-0.0427	0.1265	-0.34
	Total	164		524	460					

Non Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	14	228	160	64	-0.4752	0.0521	-0.5273	0.1532	-3.44
3000	1000-3000m	9	150	121	31	0.0968	-0.0057	0.1025	0.2120	0.48
5000	3000-5000m	6	90	77	9	0.4513	-0.0139	0.4652	0.3035	1.53
9999	>5000m	135	2161	1720	356	0.0344	-0.1506	0.1851	0.1212	1.53
	Total	164		2078	460					

Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	3708	14834	478	613	0.0988	-0.5389	0.6377	0.1353	4.71
5-15	degrees	856	3422	61	81	-0.5081	0.0879	-0.5959	0.1373	-4.34
15-30	degrees	54	216	2	3	-1.1701	0.0083	-1.1784	0.7118	-1.66
30-45	degrees	0	1	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
9999	Missing data	1	4	0	0	0.0000	0.0000	0.0000	0.0000	0.00
-99	Missing data	3	13	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	4622		541	697					

Inventoried Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	146	584	321	398	-0.0329	0.2658	-0.2987	0.2539	-1.18
5-15	degrees	17	69	44	59	0.3415	-0.0387	0.3802	0.2646	1.44
15-30	degrees	1	5	2	3	-0.6787	0.0053	-0.6841	0.9092	-0.75
30-45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		367	460					

Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	146	2334	457	398	-0.0219	0.1636	-0.1854	0.1484	-1.25
5-15	degrees	17	275	67	59	0.2582	-0.0328	0.2910	0.1498	1.94
15-30	degrees	1	20	0	3	0.0000	0.0000	0.0000	0.0000	0.00
30-45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		524	460					

Non Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	146	2334	1830	398	-0.0368	0.3240	-0.3608	0.1660	-2.17
5-15	degrees	17	275	227	59	0.2280	-0.0247	0.2526	0.1666	1.52
15-30	degrees	1	20	21	3	0.0000	-0.0111	0.0000	0.0000	0.00
30-45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degree	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	164		2078	460					

Landform

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	2106	8425	338	434	0.3193	-0.3690	0.6883	0.0895	7.69
2	Piedmont	1419	5675	145	178	-0.1470	0.0591	-0.2061	0.0983	-2.10
3	Mountain	1097	4390	62	85	-0.7513	0.1552	-0.9065	0.1360	-6.66
	Total	4622		545	697					

Inventoried Landform

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	109	435	206	254	-0.3318	0.7064	-1.0381	0.1771	-5.86
2	Piedmont	31	123	112	139	2.0683	-0.3259	2.3941	0.3242	7.38
3	Mountain	25	100	48	67	-0.3000	0.0543	-0.3543	0.2180	-1.63
	Total	164		366	460					

Site 250 Grid Landform

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	109	1739	294	254	-0.2009	0.3346	-0.5355	0.0998	-5.37
2	Piedmont	31	493	157	139	0.6299	-0.1823	0.8122	0.1124	7.23
3	Mountain	25	398	73	67	-0.1036	0.0178	-0.1214	0.1398	-0.87
	Total	164		524	460					

Non Site 250 Grid Landform

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	109	1739	1411	254	0.1350	-0.2367	0.3717	0.0986	3.77
2	Piedmont	31	493	351	139	-0.4212	0.1126	-0.5338	0.1136	-4.70
3	Mountain	25	398	316	67	0.0183	-0.0032	0.0215	0.1341	0.16
	Total	164		2078	460					

Chi-square

Pilot Vegetation			
Points on 250m grid			
	Site	Not Site	ROW
Desert shrub	269	831	1100.00
Other veg	255	1243	1498.00
COL	524.00	2074.00	2598.00
Expected values			
	Site	Not Site	
Desert shrub	221.86	878.14	
Other veg	302.14	1195.86	
Cell chi values			
	Site	Not Site	
Desert shrub	47.14	-47.14	
Other veg	-47.14	47.14	
Chi-squares			
	Site	Not Site	
Desert shrub	10.01	2.53	
Other veg	7.35	1.86	
21.76	Chi Square		
Cell std. residuals			
	Site	Not Site	
Desert shrub	3.16	-1.59	
Other veg	-2.71	1.36	
Cell variance			
	Site	Not Site	
Desert shrub	0.46	0.12	
Other veg	0.34	0.09	
Adj. std. residuals			
	Site	Not Site	
Desert shrub	4.66	-4.66	
Other veg	-4.66	4.66	
			0.00

Pilot Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
0-200m	231	877	1108.00
>200m	293	1201	1494.00
COL	524.00	2078.00	2602.00
Expected values			
	Site	Not Site	
<200m	223.13	884.87	
>200m	300.87	1193.13	
Cell chi values			
	Site	Not Site	
<200m	7.87	-7.87	
>200m	-7.87	7.87	
Chi-squares			
	Site	Not Site	
<200m	0.28	0.07	
>200m	0.21	0.05	
0.60	Chi Square		
Cell std. residuals			
	Site	Not Site	
<200m	0.53	-0.26	
>200m	-0.45	0.23	
Cell variance			
	Site	Not Site	
<200m	0.46	0.12	
>200m	0.34	0.08	
Adj. std. residuals			
	Site	Not Site	
<200m	0.78	-0.78	
>200m	-0.78	0.78	
			0.00

Pilot Wetland			
Points on 250m grid			
	Site	Not Site	ROW
0-1000m	62	160	222.00
>1000m	462	1918	2380.00
COL	524.00	2078.00	2602.00
Expected values			
	Site	Not Site	
<1000m	44.71	177.29	
>1000m	479.29	1900.71	
Cell chi values			
	Site	Not Site	
<1000m	17.29	-17.29	
>1000m	-17.29	17.29	
Chi-squares			
	Site	Not Site	
<1000m	6.69	1.69	
>1000m	0.82	0.16	
9.18	Chi Square		
Cell std. residuals			
	Site	Not Site	
<1000m	2.59	-1.30	
>1000m	-0.79	0.40	
Cell variance			
	Site	Not Site	
<1000m	0.46	0.12	
>1000m	0.34	0.08	
Adj. std. residuals			
	Site	Not Site	
<1000m	3.81	-3.82	
>1000m	-1.36	1.36	
			-0.01

Pilot Slope			
Points on 250m grid			
	Site	Not Site	ROW
5-15 degree	67	227	294.00
Not 5-15 degr	457	1851	2308.00
COL	524.00	2078.00	2602.00
Expected values			
	Site	Not Site	
5-15 degree	59.21	234.79	
Not 5-15 degr	464.79	1843.21	
Cell chi values			
	Site	Not Site	
5-15 degree	7.79	-7.79	
Not 5-15 degr	-7.79	7.79	
Chi-squares			
	Site	Not Site	
5-15 degree	1.03	0.26	
Not 5-15 degr	0.13	0.03	
1.45	Chi Square		
Cell std. residuals			
	Site	Not Site	
5-15 degree	1.01	-0.51	
Not 5-15 degr	-0.36	0.18	
Cell variance			
	Site	Not Site	
5-15 degree	0.46	0.12	
Not 5-15 degr	0.34	0.08	
Adj. std. residuals			
	Site	Not Site	
5-15 degree	1.49	-1.50	
Not 5-15 degr	-0.62	0.62	
			0.00

Pilot Landform			
Points on 250m grid			
	Site	Not Site	ROW
Piedmont	157	351	508.00
Not Piedmont	367	1727	2094.00
COL	524.00	2078.00	2602.00
Expected values			
	Site	Not Site	
Piedmont	102.30	405.70	
Not Piedmont	421.70	1672.30	
Cell chi values			
	Site	Not Site	
Piedmont	54.70	-54.70	
Not Piedmont	-54.70	54.70	
Chi-squares			
	Site	Not Site	
Piedmont	29.24	7.37	
Not Piedmont	7.09	1.79	
45.50	Chi Square		
Cell std. residuals			
	Site	Not Site	
Piedmont	5.41	-2.72	
Not Piedmont	-2.66	1.34	
Cell variance			
	Site	Not Site	
Piedmont	0.46	0.12	
Not Piedmont	0.34	0.08	
Adj. std. residuals			
	Site	Not Site	
Piedmont	7.97	-7.99	
Not Piedmont	-4.58	4.59	
			-0.01

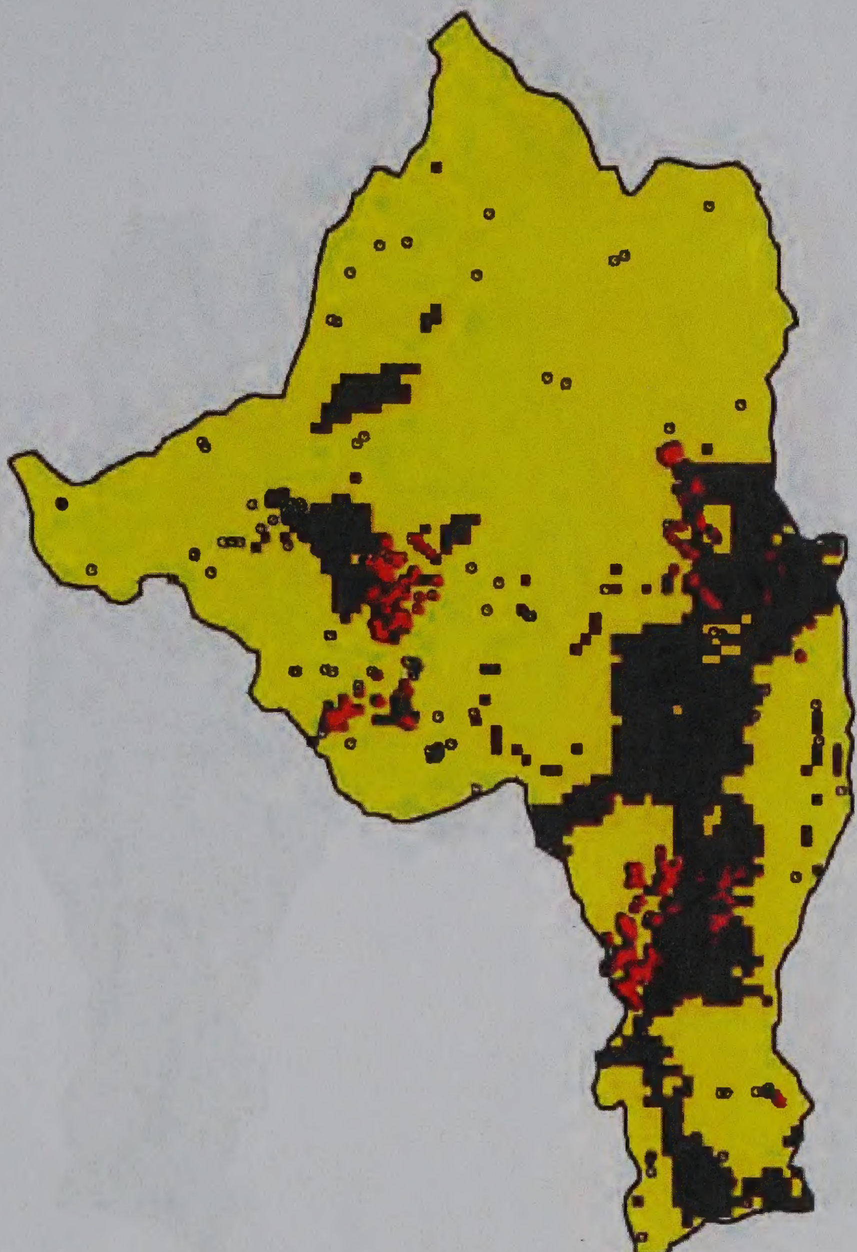
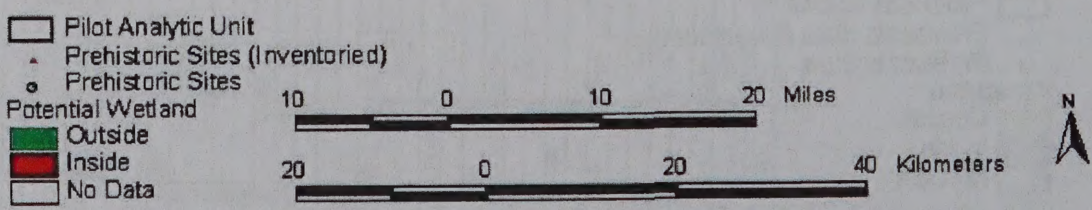


Figure 5.3 Pilot/Thousand Springs Valley Analytic Unit Predictive Pattern - Vegetation

Figure 5.4 Pilot/Thousand Springs Valley Analytic Unit Predictive Pattern - Potential Wetland



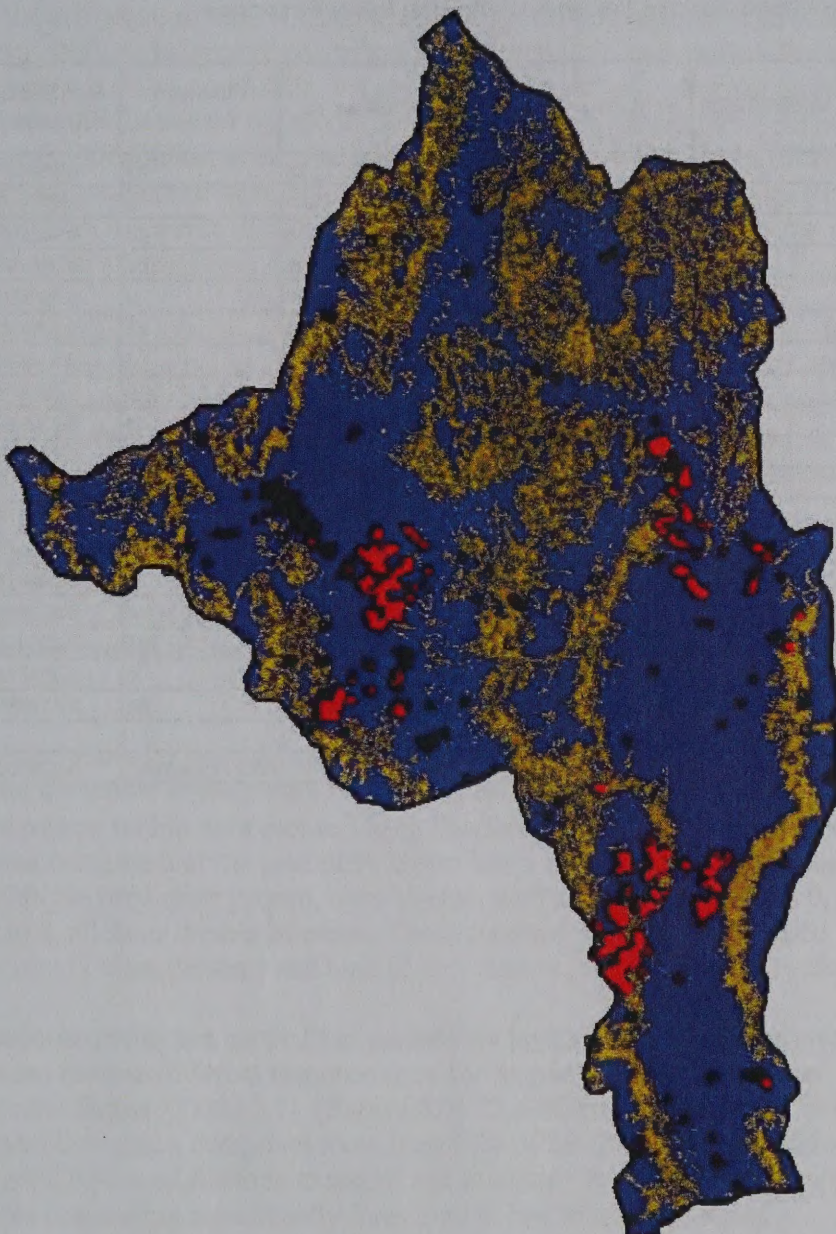


Figure 5.5 Pilot/Thousand Springs Valley Analytic Unit Predictive Pattern - Landform

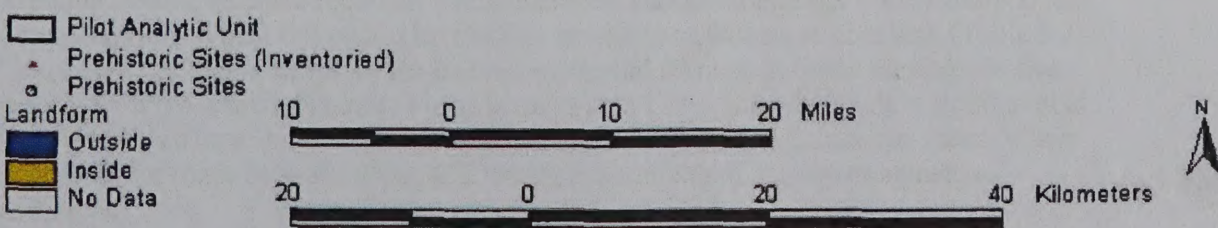


Table 5.4
Pilot/Thousand Springs Valley Analytic Unit Initial Response

VALUE	VEGETATION	WETLAND	LANDFORM	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
15	1	1	0	127205271.26	27	0.08914740	0.08815663	High
16	1	1	1	11264254.51	3	0.07376867	0.07294882	
17	1	-99	0	232360.16	0	0.06326964	0.06256647	Med
12	1	0	0	649434729.06	151	0.05970432	0.05904077	
18	1	-99	1	73729.67	0	0.05209971	0.05152068	
11	1	0	1	147049722.54	45	0.04913082	0.04858479	
7	-99	1	0	1558749.40	0	0.04460453	0.04410880	
8	-99	1	1	186186.02	0	0.03660108	0.03619430	Low
5	0	1	0	334060179.26	51	0.03294264	0.03257652	
10	-99	-99	0	1175206.19	0	0.03121361	0.03086671	
2	-99	0	0	29847109.30	0	0.02939800	0.02907127	
6	0	1	1	76886636.14	12	0.02697262	0.02667285	
9	-99	-99	1	348540.24	0	0.02554865	0.02526471	
3	-99	0	1	10720591.32	0	0.02405438	0.02378704	
13	0	-99	0	1144671.68	0	0.02296862	0.02271335	
1	0	0	0	2059061784.98	171	0.02162189	0.02138159	
14	0	-99	1	334390.10	0	0.01877105	0.01856243	
4	0	0	1	1171955381.80	85	0.01766599	0.01746965	
					Prior Probability	0.02900000		

5.6) discernable break for low probability. With breaks at those points, well over one-half of the sites within the analytic unit falls within the area of lowest probability. In an attempt to capture additional sites and balance the distribution of sites within each probability zone, breaks were re-drawn at 0.044 and 0.029, just above the intersection with prior probability. (Table 5.5) (**Figure 5.7**) Results of the model derived from those parameters were tallied and show an almost even distribution of sites within high to moderate and low probability areas. (Table 5.6) The results appear to be biased by a relatively high frequency of sites (training points) lying within the large area of flats and sagebrush, with a corresponding low weight and contrast relating to a normalized distribution. (**Figure 5.8**)

The response table presents a tally of presence or absence of predictive evidential classes, then recalculates probabilities based upon the area and number of training points within each row of tabulated intersections. If large areas contain a proportional number of sites, probabilities will by definition remain near the prior probability. Likewise, negative weights and negative contrasts will still retain their lower probabilities in the response theme.

The logic behind the response theme is that as intersecting predictive themes overlap, corresponding probabilities validate the predictive relationship within each defined class. Probability based correlations fail when a significant number of the evidential classes exhibit negative contrasts as a result of lower than expected frequencies within disproportionately large areas.

In order to derive a version of the response theme based upon the overlap of predictive evidential classes, evidential themes were reclassified using the binary values assigned to inside or outside pattern within each theme. Using *Spatial Analyst®*, a new class was calculated by combining each of the predictive layers into a single class. Rows containing 1, for presence within the predictive pattern, were totaled, with results ranging from 0, no overlap present to 3, all three themes intersect. Those results were then re-classified into low (0 overlap), medium (1 class present) and high (2 or 3 classes present) sensitivity zones.

The resulting response presents a better fit of probability layers to the actual site area. Total area varies between the two different response runs due to grid variation within the vegetation evidential theme. (Table 5.7) (**Figure 5.9**) The distribution of sites within high and medium probability zones comprises more than 70% of the total site area within 55% of the total model area. Ratios of site area to model and inventory area exhibit the same trend, with highest ratios descending significantly from high to low sensitivity zones.

Historic Evidential Themes

Sixty-nine historic sites are recorded within the Pilot/Thousand Springs Valley analytic unit. Of those, only 19 (28%) fall within inventories greater than 640 acres in extent. (Table 5.2) (**Figure 5.10**). Weights tables for the historic evidential themes, indicate varying positive contrasts within buffered distances to roads and water. Chi-square for roads is significant at the 400 meter buffer of inventoried sites, but is not significant for distance to water. When buffer areas for roads between 0 and 400 meters are combined, chi-square remains significant.

Figure 5.6 Pilot/Thousand Springs Valley Response Breaks

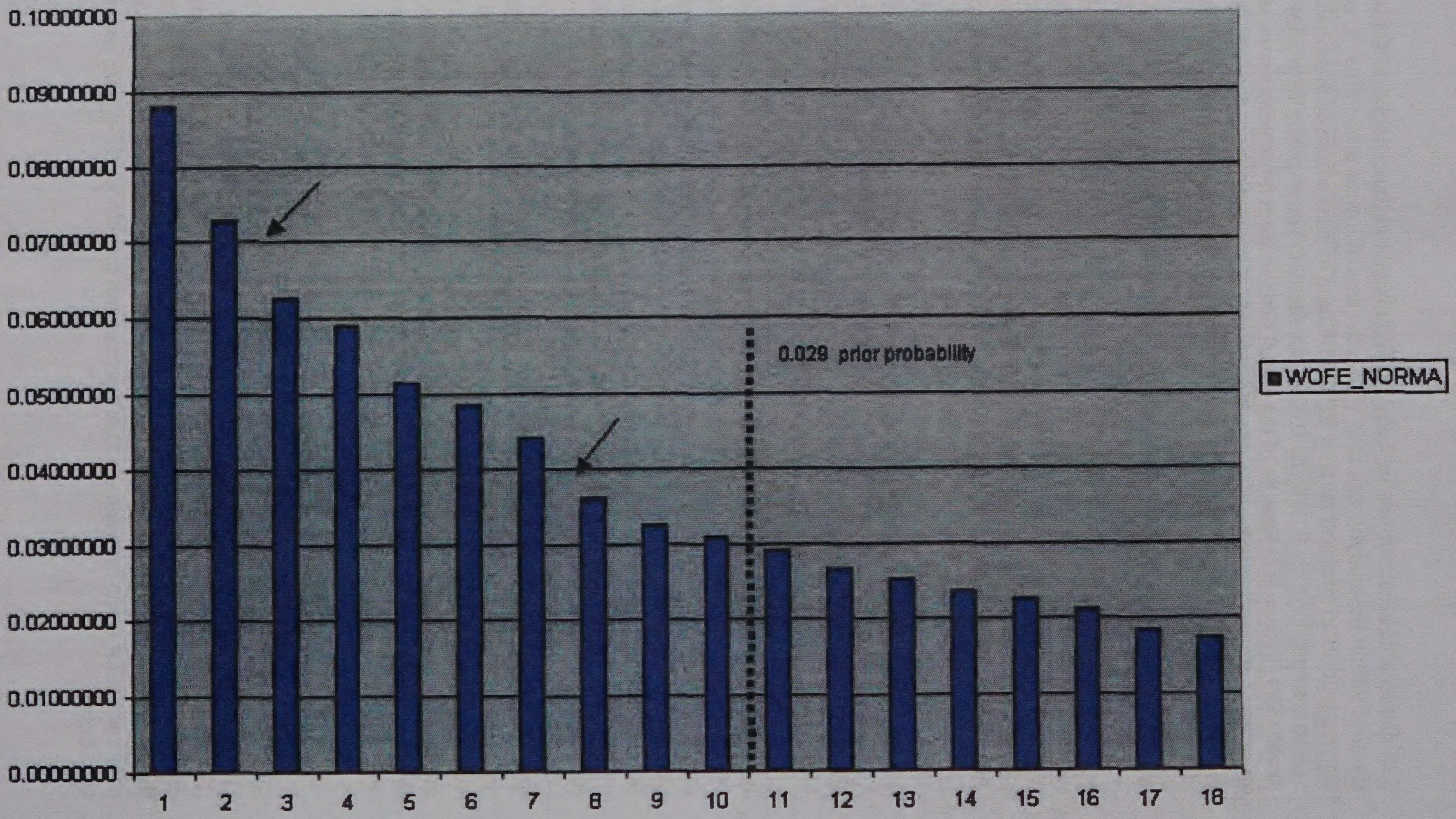


Table 5.5
Pilot/Thousand Springs Valley Analytic Unit Observed Response

VALUE	COUNT	VEGETATION	WETLAND	LANDFORM	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
15	170804	1	1	0	127205271.26	27	0.08914740	0.08815663	High
16	15125	1	1	1	11264254.51	3	0.07376867	0.07294882	
17	312	1	-99	0	232360.16	0	0.06326964	0.06256647	
12	872024	1	0	0	649434729.06	151	0.05970432	0.05904077	
18	99	1	-99	1	73729.67	0	0.05209971	0.05152068	
11	197450	1	0	1	147049722.54	45	0.04913082	0.04858479	
7	2093	-99	1	0	1558749.40	0	0.04460453	0.04410880	Medium
8	250	-99	1	1	186186.02	0	0.03660108	0.03619430	
5	448557	0	1	0	334060179.26	51	0.03294264	0.03257652	
10	1578	-99	-99	0	1175206.19	0	0.03121361	0.03086671	
2	40077	-99	0	0	29847109.30	0	0.02939800	0.02907127	
6	103239	0	1	1	76886636.14	12	0.02697262	0.02667285	Low
9	468	-99	-99	1	348540.24	0	0.02554865	0.02526471	
3	14395	-99	0	1	10720591.32	0	0.02405438	0.02378704	
13	1537	0	-99	0	1144671.68	0	0.02296862	0.02271335	
1	2764791	0	0	0	2059061784.98	171	0.02162189	0.02138159	
14	449	0	-99	1	334390.10	0	0.01877105	0.01856243	
4	1573635	0	0	1	1171955381.80	85	0.01766599	0.01746965	

Figure 5.7 Pilot/Thousand Springs Valley Observed Response Breaks

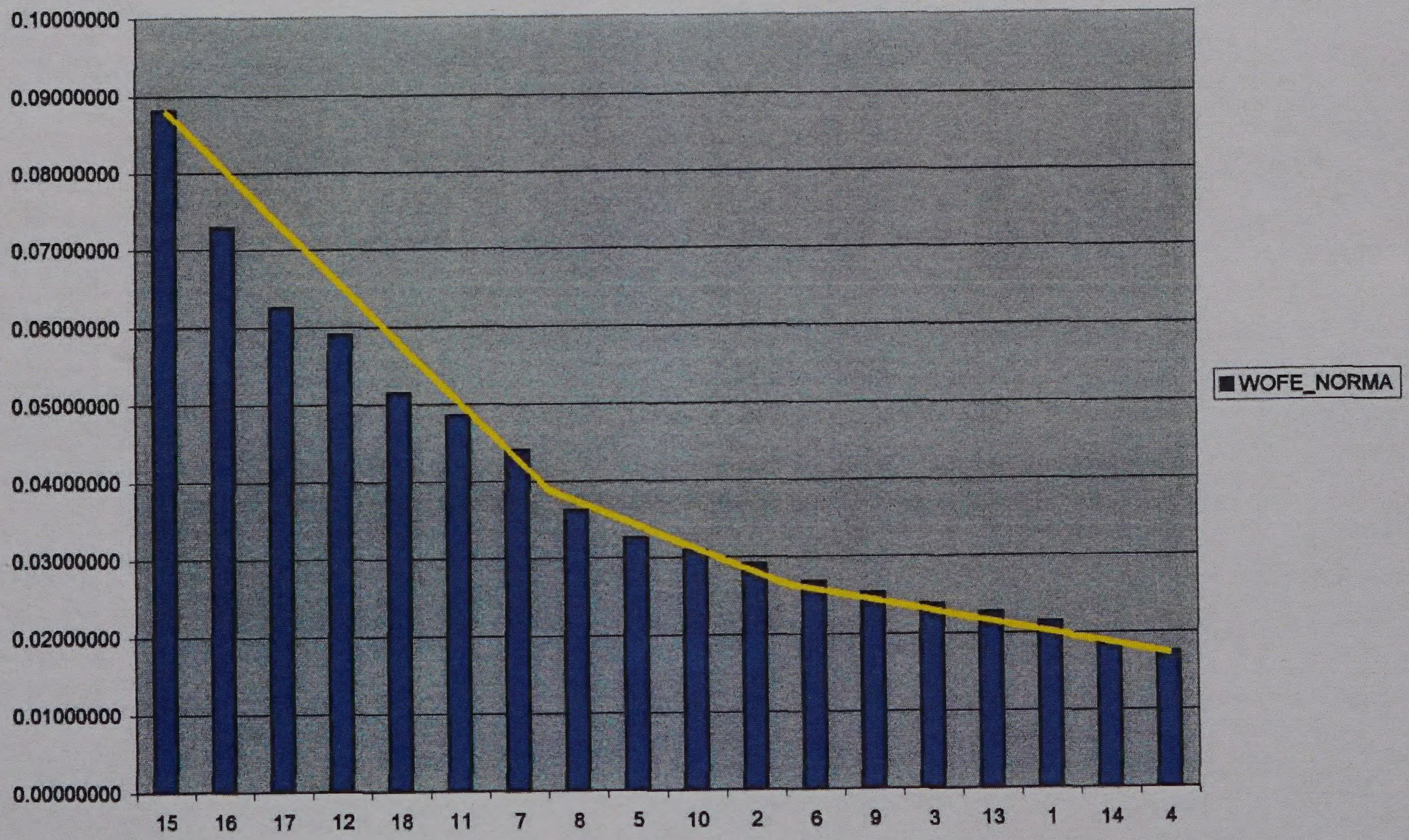


Table 5.6
Pilot/Thousand Springs Valley Analytic Unit Model Summary Prehistoric Observed Response

	High	Medium	Low	Total
Model area (m2)	936818816.60	365268680.77	3320451996.26	4622539493.63
Model area (km2)	936.82	365.27	3320.45	4622.54
% Model area	20.27%	7.90%	71.83%	100.00%
All sites area (m2)	6197760.50	2739168.75	9528256.00	18465185.25
All sites area (km2)	6.20	2.74	9.53	18.47
% Site area	33.56%	14.83%	51.60%	100.00%
All site area / model area	**0.0066**	**0.0075**	**0.0029**	**0.0040**
Inventory area (m2)	69817528.00	4245041.50	90317352.00	164379921.50
Inventory area (km2)	69.82	4.25	90.32	164.38
% Inventory area	42.47%	2.58%	54.94%	100.00%
% Model area inventoried	**7.45%**	**1.16%**	**2.72%**	**3.56%**
Inventory sites area (m2)	5051599.00	210762.58	3664885.75	8927247.33
Inventory sites area (km2)	5.05	0.21	3.66	8.93
% Inventory site area	56.59%	2.36%	41.05%	100.00%
Inv site area / inv area	**0.0724**	**0.0496**	**0.0406**	**0.0543**

Figure 5.8 Pilot/Thousand Springs Valley Analytic Unit Observed Probability - Prehistoric

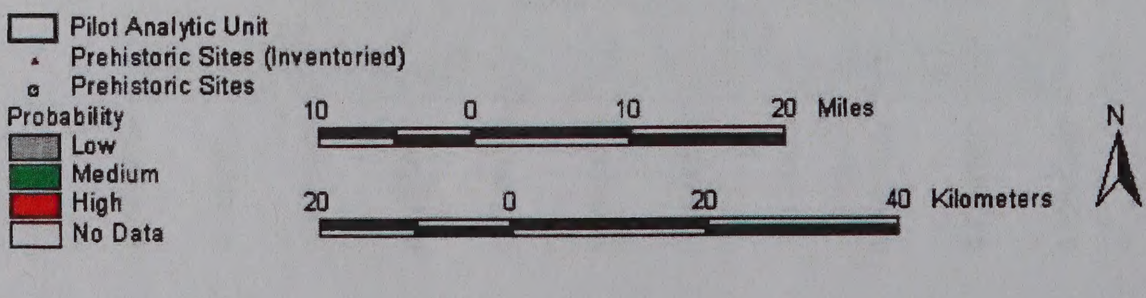


Table 5.7
Pilot/Thousand Springs Valley Analytic Unit Model Summary Prehistoric Composite

	High (3-2)	Medium (1)	Low (0)	Total
Model area (m^2)	362405888.00	2155450368.00	2059061760.00	4576918016.00
Model area (km^2)	362.41	2155.45	2059.06	4576.92
% Model area	7.92%	47.09%	44.99%	100.00%
All sites area (m^2)	3291769.00	10133733.00	4945845.50	18371347.50
All sites area (km^2)	3.29	10.13	4.95	18.37
% Site area	17.92%	55.16%	26.92%	100.00%
All site area / model area	**0.0091**	**0.0047**	**0.0024**	**0.0040**
Inventory area (m^2)	20080536.00	73597104.00	70482584.00	164160224.00
Inventory area (km^2)	20.08	73.60	70.48	164.16
% Inventory area	12.23%	44.83%	42.94%	100.00%
% Model area inventoried	**5.54%**	**3.41%**	**3.42%**	**3.59%**
Inventory sites area (m^2)	2297535.50	4528789.00	2100178.25	8926502.75
Inventory sites area (km^2)	2.30	4.53	2.10	8.93
% Inventory site area	25.74%	50.73%	23.53%	100.00%
Inv site area / inv area	**0.1144**	**0.0615**	**0.0298**	**0.0544**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

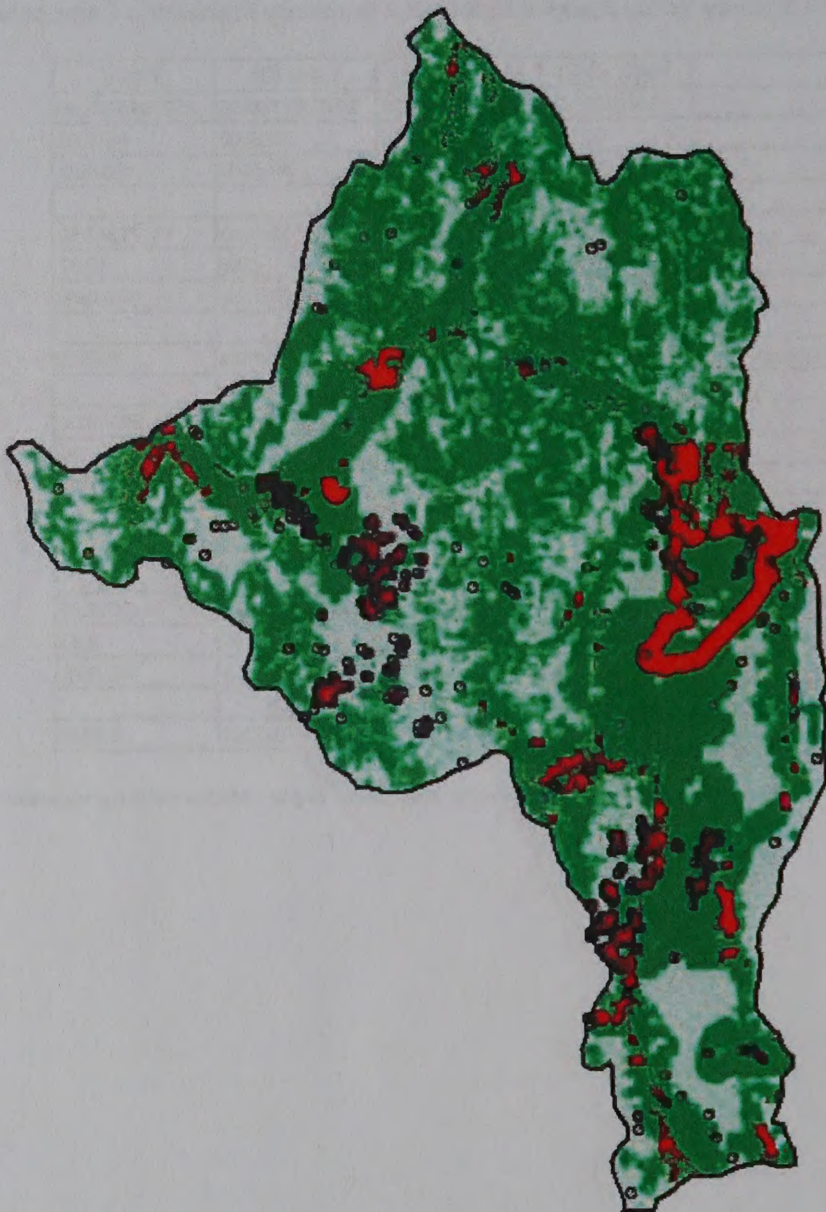


Figure 5.9 Pilot/Thousand Springs Valley Analytic Unit Composite Probability - Prehistoric

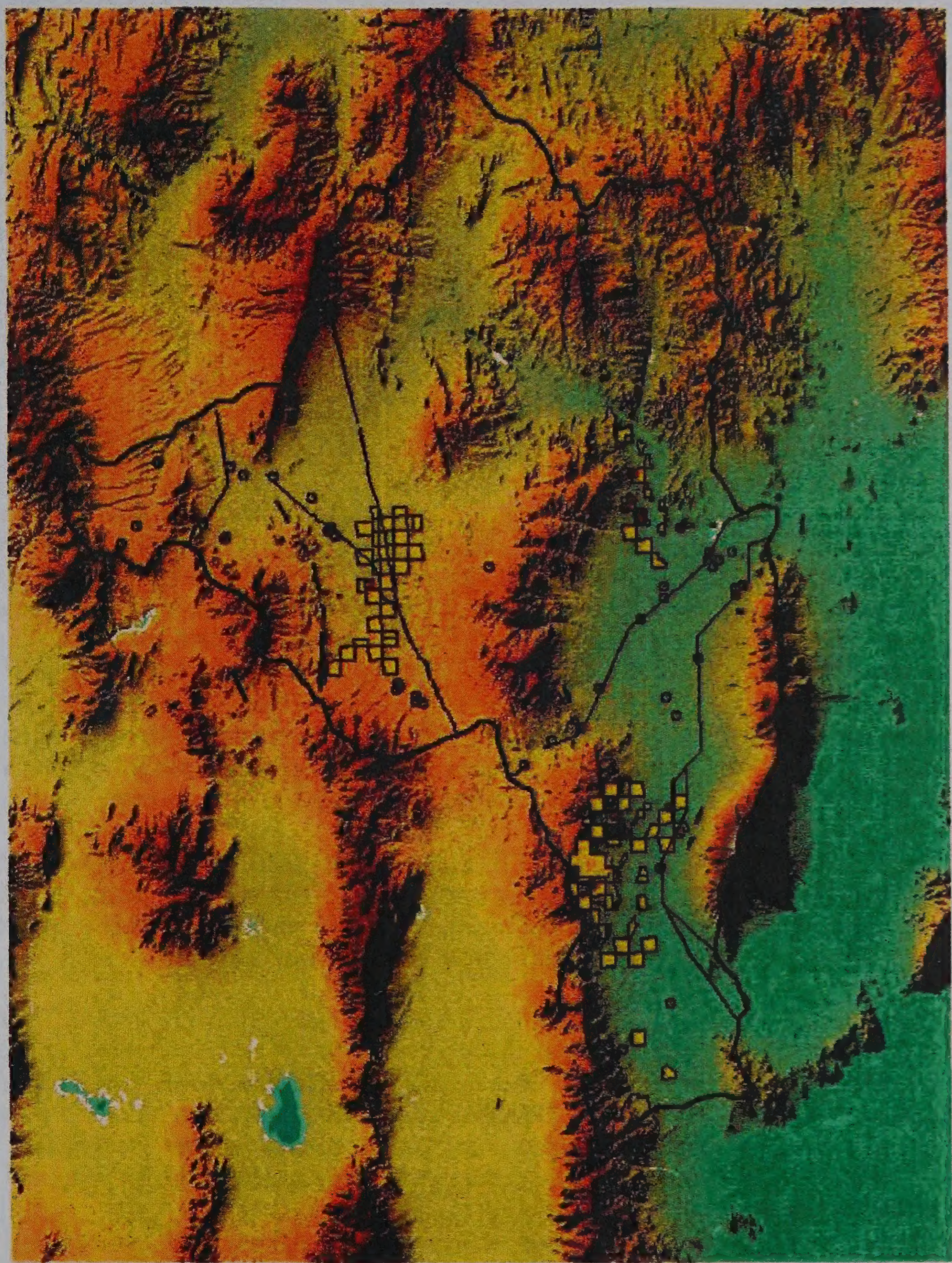


Figure 5.10 Pilot/Thousand Springs Analytic Unit - Inventories and Historic Sites

Pilot Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Inventories

10 0 10 20 Miles

20 0 20 40 Kilometers

N

Historic Predictive Response

Since a response theme cannot be created with only one class inside the pattern, the 0-400 meter buffer from water was used as a predictive theme. The resulting grid classifies probability as high or low; area within 400 meters is high, greater that 400 meters is low. (Figure 5.11) Summary tables reflect the expected site distribution with 64% of the analytic unit comprising the low probability zone, while slightly more than 8% of all sites fall within that area. More than 90% of all sites and 85% of inventoried sites fall within the high probability zone. (Table 5.8) (Figure 5.12)

RUBY/LONG VALLEY ANALYTIC UNIT

Analytic Unit Description

The Ruby/Long Valley analytic unit is the hydrographic unit within the GBRI study area. It shares its eastern boundary with the Spring/Steptoe Valley Analytic unit, and its northern extent with the Pilot/Thousand Springs Valley analytic unit (Figure 5.13). In addition to Ruby and Long valleys, the analytic unit includes Clover Valley and Independence Valley in the north along with Butte Valley and Jakes Valley in southeast. The analytic unit covers approximately 2.6 million acres (4095 mi^2)/1.0 million hectares (1060 km^2). Bounding ranges of the hydrographic unit include the White Pine Range, Ruby Mountains, and Humboldt Range to the west, Wood Hills and Windemere Hills to the north and the Pequop Mountains, Cherry Creek Range and Egan Mountains to the east. The Maverick Springs Range, Butte Mountains and Medicine Range provide a barrier between Ruby/Long Valley in the western portion of the analytic unit and Butte/Jakes Valley in the east.

Elevations of the Ruby Mountains and Humboldt Range exceed 3000 meters amsl. Northern ranges are lower, averaging 2700 meters amsl while southern bounding ranges and interior ranges extend to 2800 meters amsl. Likewise, valley floor are relatively high averaging 2000 meters in elevation with valley floors between 1850 and 1800 meters.

Hydrologically, each of the valleys within the analytic unit is internally drained. The Franklin River and the Ruby Marshes, consisting of Ruby Lake and Franklin Lake are the major hydrographic features within Ruby Valley. Snow Water Lake serves as a major hydrologic collection point for Clover Valley. Bounding mountains of the remaining valleys provide ample perennial flow, but all terminate in dry flats at the valley bottom. Faulting has produced numerous springs along the steeper eastern escarpment of the bounding and interior mountain ranges.

Vegetation is similar to that in Spring/Steptoe Valley. Limber pine and alpine vegetation occurs on the highest slopes, with juniper/pinyon woodlands on lower more protected slopes. Riparian meadows and wetland habitat dominates the area of perennial lakes and marshes, while sagebrush is the dominant vegetation on the piedmont and upper valley slopes. Lowest portions of the valley floor consist of desert shrub communities while dry flats and valley bottomland is sparsely vegetated.

Figure 5.11 Pilot/Thousand Springs Valley Analytic Unit Predictive Pattern - Roads

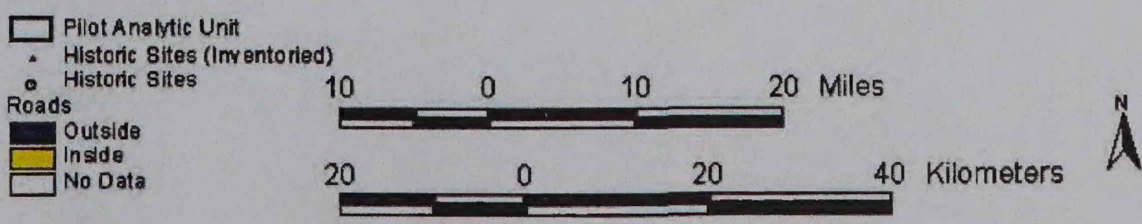


Table 5.8
Pilot/Thousand Springs Valley Analytic Unit Model Summary Historic Composite

	High (1) (0-400)	Medium	Low (0) (>400)	Total
Model area (m^2)	1652891008.00		2969638912.00	4622529920.00
Model area (km^2)	1652.89	0.00	2969.64	4622.53
% Model area	35.76%	0.00%	64.24%	100.00%
All sites area (m^2)	2138905.0000		192888.7188	2331793.72
All sites area (km^2)	2.14	0.00	0.19	2.33
% Site area	91.73%	0.00%	8.27%	100.00%
All site area / model area	**0.0013**	**0.0000**	**0.0001**	**0.0005**
Inventory area (m^2)	64854552.00		99525368.00	164379920.00
Inventory area (km^2)	64.85	0.00	99.53	164.38
% Inventory area	39.45%	0.00%	60.55%	100.00%
% Model area inventoried	**3.92%**	**0.00%**	**3.35%**	**3.56%**
Inventory sites area (m^2)	274065.84		49153.11	323218.95
Inventory sites area (km^2)	0.27	0.00	0.05	0.32
% Inventory site area	84.79%	0.00%	15.21%	100.00%
Inv site area / Inv area	**0.0042**	**0.0000**	**0.0005**	**0.0020**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

Figure 5.12 Pilot/Thousand Springs Valley Analytic Unit Composite Probability - Historic

Pilot Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Probability
Low
High
No Data

10 0 10 20 Miles

20 0 20 40 Kilometers

N

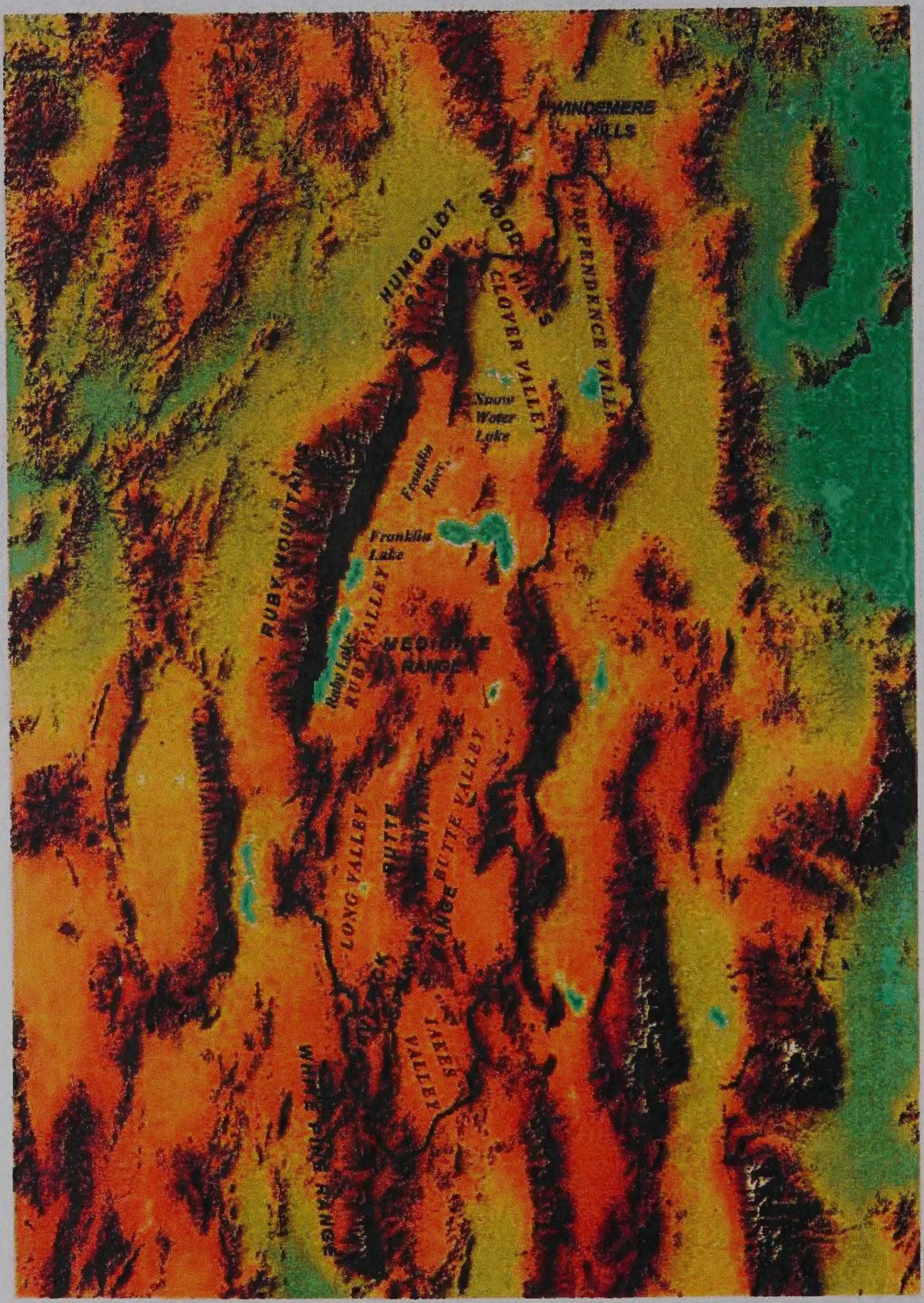
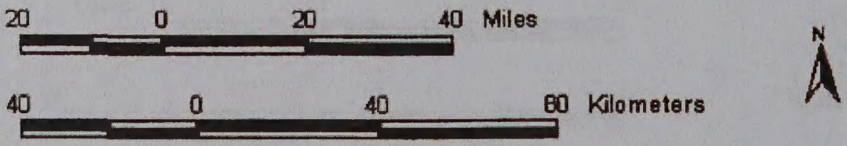


Figure 5.13 Ruby/Long Valley Analytic Unit



Analytic Results

Prehistoric Evidential Themes

Of 10,606 square kilometers in the Ruby/Long Valley analytic unit, approximately 927 square kilometers, 8.5% of the total area, have been inventoried. (Figure 5.14) Six hundred thirty-eight sites are reported as part of inventories greater than 640 acres, 973 sites are identified within the entire analytic unit. (Table 5.9)

All analytic classes, were sampled during previous inventories. The Ruby Marshes and surrounding marsh and wetland habitat have been extensively investigated, and unlike most of the analytic units, steeper slopes have been more intensively examined.

Weights of evidence tables identify classes within each evidential theme that lie "inside" the predictive pattern. (Table 5.10) Normalized contrast for meadows are highest in all runs of prehistoric sites. Other vegetation classes display negative or very low positive contrasts. Sagebrush and water have relatively high contrasts when all sites are considered. Meadows within the analytic unit cover less than 2% of the entire area and are considered part of the marsh environment. (Figure 5.15)

Contrasts for distance to springs and streams are consistently high for inventoried areas between 1000 and 2000 meters from that class of water. Buffered areas from 200 to 1000 meters from a water course are consistently sampled, but reveal lower than expected or marginal site frequencies. The lowest contrasts are evident at distances more than 2000 meters from springs and streams. (Figure 5.16)

Proximity to wetlands is highly predictive within the Ruby/Long Valley analytic unit. Highest contrasts are evident within 1000 meters of potential wetland habitat, while areas lying more than 3000 meters from that zone show a negative correlation with normal site distribution. Proximity to wetlands correlates well with vegetation contrasts. (Figure 5.17)

Slopes between 0 and 5 degrees are highly predictive for sites within this analytic unit. Nearly two-thirds of the inventoried area occurs on flat slopes, and positive contrasts are evident on slopes up to 15 degrees. Slopes above 15 degrees uniformly exhibit a negative contrast. (Figure 5.18)

Landform strengthens the relationship of slope as a predictive theme in the Ruby/Long Valley analytic unit. When all sites are considered, both flats and piedmont have a high predictive contrast, while inventoried areas show highest contrasts within the piedmont. Chi-square statistics confirm a non-random distribution of sites on the piedmont. (Figure 5.19)

Prehistoric Predictive Response

Normalized posterior probabilities were used as a means to evaluate tabular results from the response theme generated for the Ruby/Long Valley analytic unit. (Figure 5.20) Prior probability for the response theme was set at 0.0181 and observed breaks within normalized

Figure 5.14 Ruby/Long Valley Analytic Unit - Inventories and Prehistoric Sites

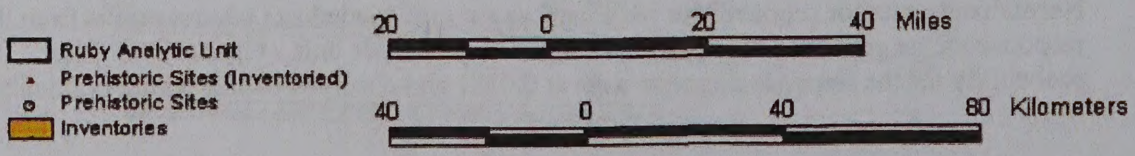


Table 5.9
Ruby/Long Valley Analytic Unit Inventory Summary

Potential Vegetation

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
2	Great Basin pine	3.45	0	0.59	17.16%	0
22	Juniper/pinyon	1648.84	84	86.35	5.24%	53
25	Sagebrush	5776.50	576	548.10	9.49%	392
28	Desert shrub	2829.80	275	253.32	8.95%	162
37	Meadow	18.99	18	16.04	84.47%	18
62	Barren	211.76	8	4.48	2.12%	1
63	Water	13.01	9	11.02	84.75%	9
9999	Missing data	28.81	1	0.98	3.41%	1
-99	No data	75.01	2	6.65	8.87%	2
	Total	8878.86	889	927.54	10.45%	585

Streams and Springs

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	3061.68	339	286.61	9.30%	191
400	200-400m	2354.30	222	209.85	8.91%	154
1000	400-1000m	3429.90	277	301.86	8.80%	208
2000	1000-2000m	1222.44	110	90.82	7.43%	70
9999	>2000m	517.84	25	38.39	7.41%	15
	Total	10606.15	973	927.54	8.75%	638

Potential Wetlands

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1000	0-1000m	1005.99	298	190.98	18.98%	247
3000	1000-3000m	1276.66	140	190.45	14.92%	108
5000	3000-5000m	924.36	75	147.48	15.95%	54
9999	>5000m	7399.15	460	398.62	5.39%	229
	Total	10606.15	973	927.54	8.75%	638

Landform

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1	Flat	6081.49	630	555.87	9.14%	394
2	Piedmont	2098.94	232	151.71	7.23%	160
3	Mountain	2425.72	111	219.96	9.07%	84
	Total	10606.15	973	927.54	8.75%	638

Slope

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
0-5	degrees	7021.82	741	626.50	8.92%	470
5-15	degrees	2114.87	164	164.71	7.79%	119
15-30	degrees	1225.90	43	114.99	9.38%	35
30-45	degrees	140.24	14	19.05	13.58%	13
>45	degrees	2.70	1	0.51	18.92%	1
9999	Missing data	100.63	10	1.78	1.77%	0
	Total	10606.15	973	927.54	8.75%	638

Summary Vegetation

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Great Basin pine	146	59	0	0.0000	0.0000	0.00	0.0000	0.0000	0.00
Juniper/pinyon	21337	8635	53	0.0025	0.2484	402.59	0.0061	0.6138	162.92
Sagebrush	135439	54810	392	0.0029	0.2894	345.51	0.0072	0.7152	139.82
Desert shrub	62597	25332	162	0.0026	0.2588	386.40	0.0064	0.6395	156.37
Meadow	3963	1604	18	0.0045	0.4542	220.18	0.0112	1.1223	89.10
Barren	1107	448	0	0.0000	0.0000	0.00	0.0000	0.0000	0.00
Water	2724	1102	1	0.0004	0.0367	2723.84	0.0009	0.0907	1102.30
Missing data	243	98	9	0.0371	3.7078	26.97	0.0916	9.1622	10.91
No data	1643	665	2	0.0012	0.1217	821.70	0.0030	0.3007	332.53
Total	227556	92089	635	0.0028	0.2791	358.36	0.0069	0.6896	145.02

Summary Water

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	70822	28661	191	0.0027	0.2697	370.79	0.0067	0.6664	150.06
200-400m	51856	20985	154	0.0030	0.2970	336.73	0.0073	0.7338	136.27
400-1000m	74591	30186	208	0.0028	0.2789	358.61	0.0069	0.6891	145.12
1000-2000m	22443	9082	70	0.0031	0.3119	320.61	0.0077	0.7707	129.75
>2000m	9487	3839	15	0.0016	0.1581	632.50	0.0039	0.3907	255.96
Total	229199	92754	638	0.0028	0.2784	359.25	0.0069	0.6878	145.38

Summary Wetland

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	47193	19098	247	0.0052	0.5234	191.06	0.0129	1.2933	77.32
1000-3000m	47062	19045	108	0.0023	0.2295	435.76	0.0057	0.5671	176.35
3000-5000m	36443	14748	54	0.0015	0.1482	674.87	0.0037	0.3662	273.11
>5000m	98501	39862	229	0.0023	0.2325	430.14	0.0057	0.5745	174.07
Total	229199	92754	638	0.0028	0.2784	359.25	0.0069	0.6878	145.38

Summary Landform

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Flat	137359	55587	394	0.0029	0.2868	348.63	0.0071	0.7088	141.08
Piedmont	37488	15171	160	0.0043	0.4268	234.30	0.0105	1.0547	94.82
Mountain	54352	21996	84	0.0015	0.1545	647.05	0.0038	0.3819	261.85
Total	229199	92754	638	0.0028	0.2784	359.25	0.0069	0.6878	145.38

Summary Slope

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-5°	154812	62650	470	0.0030	0.3036	329.39	0.0075	0.7502	133.30
5-15°	40700	16471	119	0.0029	0.2924	342.02	0.0072	0.7225	138.41
15-30°	28414	11499	35	0.0012	0.1232	811.84	0.0030	0.3044	328.54
30-45°	4707	1905	13	0.0028	0.2762	362.07	0.0068	0.6825	146.53
>45°	126	51	1	0.0079	0.7933	126.06	0.0196	1.9604	51.01
Missing data	440	178	0	0.0000	0.0000	0.00	0.0000	0.0000	0.00
Total	228759	92576	638	0.0028	0.2789	358.56	0.0069	0.6892	145.10

Roads (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	2627.97	118	247.95	9.44%	61
400	200-400m	1953.24	20	176.60	9.04%	11
600	400-600m	1458.87	8	131.21	8.99%	3
800	600-800m	1097.54	4	96.24	8.77%	3
1000	800-1000m	832.49	2	70.07	8.42%	2
9999	>1000m	2636.04	5	205.47	7.79%	1
-99	No data	0.02	0	0.00	8.38%	0
	Total	10606.17	157	927.54	8.75%	81

Water (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	3081.68	63	286.61	9.30%	26
400	200-400m	2354.30	37	209.85	8.91%	21
1000	400-1000m	3429.90	44	301.86	8.80%	29
9999	>1000m	1740.28	13	129.22	7.43%	5
	Total	10606.15	157	927.54	8.75%	81

Summary Inventoried Roads (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	61271	24795	61	0.0010	0.0996	1004.44	0.0025	0.2460	406.48
200-400m	43638	17660	11	0.0003	0.0252	3967.08	0.0006	0.0623	1605.42
400-600m	32423	13121	3	0.0001	0.0093	10807.73	0.0002	0.0229	4373.73
600-800m	23781	9624	3	0.0001	0.0126	7926.86	0.0003	0.0312	3207.89
800-1000m	17315	7007	2	0.0001	0.0116	8657.34	0.0003	0.0285	3503.50
>1000m	50772	20547	1	0.0000	0.0020	50771.93	0.0000	0.0049	20546.67
No data	0	0	0	0.0000	0.0000	0.00	0.0000	0.0000	0.00
Total	229199	92754	81	0.0004	0.0353	2829.62	0.0009	0.0873	1145.11

Summary Water (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	70822	28661	26	0.0004	0.0367	2723.91	0.0009	0.0907	1102.33
1000-3000m	51856	20985	21	0.0004	0.0405	2469.34	0.0010	0.1001	999.31
3000-5000m	74591	30186	29	0.0004	0.0389	2572.10	0.0010	0.0961	1040.89
>5000m	31930	12922	5	0.0002	0.0157	6386.07	0.0004	0.0387	2584.35
Total	229199	92754	81	0.0004	0.0353	2829.62	0.0009	0.0873	1145.11

Table 5.10
Ruby/Long Valley Analytic Unit Prehistoric Evidential Theme Weights/Chi-Square

Theme Weight

ALL SITES

Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	3	14	0	0					
22	Juniper/pinyon	1649	6595	45	84	-0.5506	0.0761	-0.6267	0.1569	-3.99
25	Sagebrush	5777	23106	298	576	0.0922	-0.1245	0.2167	0.0922	2.35
28	Desert shrub	2830	11319	127	275	-0.0488	0.0174	-0.0662	0.1035	-0.64
37	Meadow	19	76	16	18	3.1090	-0.0313	3.1404	0.2851	11.01
62	Barren	212	847	1	8	-2.3106	0.0185	-2.3291	1.0016	-2.33
63	Water	13	52	8	9	2.7246	-0.0152	2.7398	0.3870	7.08
9999	Missing data	29	115	1	1	-0.3082	0.0007	-0.3090	1.0054	-0.31
-99	No data	75	300		2	0.0000	0.0000	0.0000	0.0000	0.00
	Total	8880		451	888					

Inventoried Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	1	2	0	0					
22	Juniper/pinyon	86	345	44	53	-0.0332	0.0034	-0.0365	0.1693	-0.22
25	Sagebrush	548	2192	292	392	0.0180	-0.0269	0.0449	0.0998	0.45
28	Desert shrub	253	1013	121	162	-0.1069	0.0385	-0.1454	0.1122	-1.30
37	Meadow	16	64	16	16	0.7892	-0.0185	0.8077	0.2928	2.76
62	Barren	4	18	1	1	-0.9377	0.0032	-0.9409	1.0303	-0.91
63	Water	11	44	8	9	0.3844	-0.0054	0.3898	0.3939	0.99
9999	Missing data	1	4	1	1	0.8163	-0.0012	0.8175	1.1592	0.71
-99	No data	7	27	0	2	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		463	585					

Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	1	9	0	0					
22	Juniper/pinyon	86	1382	129	53	-0.0794	0.0079	-0.0873	0.0968	-0.90
25	Sagebrush	548	8770	880	392	-0.0251	0.0361	-0.0612	0.0556	-1.10
28	Desert shrub	253	4053	396	162	-0.0292	0.0109	-0.0402	0.0619	-0.65
37	Meadow	16	257	64	18	1.0919	-0.0296	1.1216	0.1470	7.63
62	Barren	4	72	3	1	-0.9373	0.0032	-0.9405	0.5905	-1.59
63	Water	11	176	25	9	0.3929	-0.0056	0.3985	0.2176	1.83
9999	Missing data	1	16	1	1	-0.4952	0.0004	-0.4957	1.0338	-0.48
-99	No data	0	0	0	2	0.0000	0.0000	0.0000	0.0000	0.00
	Total	920		1478	565					

Non Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	1	9	9	0	0.8786	-0.0004	0.8790	1.5100	0.58
22	Juniper/pinyon	86	1382	1261	53	0.2549	-0.0237	0.2786	0.0992	2.81
25	Sagebrush	548	8770	7617	392	0.0123	-0.0179	0.0302	0.0536	0.56
28	Desert shrub	253	4053	3615	162	0.0178	-0.0067	0.0245	0.0593	0.41
37	Meadow	16	257	192	18	-1.0036	0.0260	-1.0296	0.1463	-7.04
62	Barren	4	72	56	1	-0.8207	0.0055	-0.8262	0.2868	-2.88
63	Water	11	176	151	9	-0.3087	0.0042	-0.3129	0.2162	-1.45
9999	Missing data	1	16	15	1	0.9481	-0.0007	0.9488	1.2091	0.78
-99	No data	0	0	0	2	0.0000	0.0000	0.0000	0.0000	0.00
	Total	920		13116	565					

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	3082	12327	136	339	-0.0627	0.0246	-0.0873	0.1011	-0.86
400	200-400m	2354	9417	109	222	-0.0142	0.0040	-0.0183	0.1090	-0.17
1000	400-1000m	3430	13720	176	277	0.0899	-0.0459	0.1358	0.0943	1.44
2000	1000-2000m	1222	4890	83	110	0.0943	-0.0129	0.1072	0.1357	0.79
9999	>2000m	518	2071	14	25	-0.5570	0.0218	-0.5788	0.2720	-2.13
	Total	10606		498	973					

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	1148	135	191	-0.1193	0.0501	-0.1693	0.1082	-1.57
400	200-400m	210	839	106	154	-0.0397	0.0114	-0.0511	0.1176	-0.43
1000	400-1000m	302	1207	171	208	0.0927	-0.0471	0.1398	0.1022	1.37
2000	1000-2000m	91	363	60	70	0.2742	-0.0333	0.3075	0.1505	2.04
9999	>2000m	36	154	13	15	-0.4862	0.0174	-0.5036	0.2941	-1.71
	Total	927		485	638					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	4586	434	191	-0.0639	0.0276	-0.0915	0.0600	-1.52
400	200-400m	210	3358	328	154	-0.0289	0.0083	-0.0373	0.0659	-0.57
1000	400-1000m	302	4830	490	208	0.0131	-0.0064	0.0195	0.0582	0.34
2000	1000-2000m	91	1453	168	70	0.2878	-0.0355	0.3233	0.0834	3.87
9999	>2000m	36	614	48	15	-0.2737	0.0105	-0.2842	0.1529	-1.86
	Total	927		1488	638					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	4586	4092	191	0.0215	-0.0095	0.0310	0.0571	0.54
400	200-400m	210	3358	3068	154	0.2591	-0.0667	0.3258	0.0678	4.80
1000	400-1000m	302	4830	4287	208	-0.0267	0.0131	-0.0398	0.0558	-0.71
2000	1000-2000m	91	1453	1218	70	-0.4488	0.0592	-0.5080	0.0766	-6.63
9999	>2000m	38	614	549	15	0.0355	-0.0015	0.0370	0.1338	0.28
	Total	927	.	13212	638					

Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	1008	4024	177	298	1.3542	-0.3429	1.6971	0.0951	17.84
3000	1000-3000m	1277	5107	81	140	0.3052	-0.0498	0.3550	0.1224	2.90
5000	3000-5000m	924	3697	41	75	-0.0576	0.0053	-0.0629	0.1639	-0.38
9999	>5000m	7399	29597	199	460	-0.5623	0.6977	-1.2600	0.0921	-13.68
	Total	10606		498	973					

Inventoried Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	191	764	176	247	0.6885	-0.2496	0.9380	0.1049	8.94
3000	1000-3000m	190	762	81	108	-0.2343	0.0544	-0.2886	0.1292	-2.23
5000	3000-5000m	147	590	40	54	-0.7263	0.1009	-0.8272	0.1718	-4.82
9999	Missing data	399	1594	188	229	-0.1178	0.0825	-0.2003	0.0997	-2.01
	Total	927		485	638					

Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	191	3056	436	247	0.4011	-0.1283	0.5294	0.0610	8.68
3000	1000-3000m	190	3047	326	108	0.0723	-0.0194	0.0917	0.0663	1.38
5000	3000-5000m	147	2360	112	54	-0.8048	0.1061	-0.9109	0.1009	-9.02
9999	>5000m	399	6378	614	229	-0.0451	0.0329	-0.0780	0.0555	-1.41
	Total	927		1488	638					

Non Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	191	3056	2599	247	-0.3546	0.1101	-0.4647	0.0593	-7.83
3000	1000-3000m	190	3047	2705	108	-0.0262	0.0069	-0.0330	0.0645	-0.51
5000	3000-5000m	147	2360	2210	54	0.5989	-0.0866	0.6855	0.0889	7.71
9999	>5000m	399	6378	5698	229	0.0325	-0.0240	0.0565	0.0532	1.06
	Total	927		13212	638					

Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	7022	28087	373	741	0.1153	-0.2814	0.3967	0.1039	3.82
5-15	degrees	2115	8458	88	164	-0.1318	0.0307	-0.1625	0.1181	-1.38
15-30	degrees	1226	4904	29	43	-0.7011	0.0649	-0.7659	0.1920	-3.99
30-45	degrees	140	561	8	14	0.1676	-0.0028	0.1904	0.3590	0.53
>45	degrees	3	11	0	1	0.0000	0.0000	0.0000	0.0000	0.00
-99	No data	101	403		10	0.0000	0.0000	0.0000	0.0000	0.00
	Total	10607		498	973					

Inventoried Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	627	2506	363	470	0.1168	-0.2837	0.4005	0.1111	3.60
5-15	degrees	165	659	85	119	-0.0173	0.0037	-0.0210	0.1280	-0.16
15-30	degrees	115	460	29	35	-0.8063	0.0821	-0.8885	0.1984	-4.48
30-45	degrees	19	76	8	13	-0.2505	0.0048	-0.2553	0.3769	-0.68
>45	degrees	1	2	0	1	0.0000	0.0000	0.0000	0.0000	0.00
-99	No data	2	7	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		485	638					

Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	627	2506	1057	470	0.0555	-0.1249	0.1804	0.0601	3.00
5-15	degrees	165	659	305	119	0.1602	-0.0375	0.1977	0.0682	2.90
15-30	degrees	115	460	105	35	-0.6111	0.0662	-0.6773	0.1045	-6.48
30-45	degrees	19	76	17	13	-0.6353	0.0103	-0.6456	0.2511	-2.57
0->45	degrees	1	2	2	1	1.0683	-0.0009	1.0692	0.8143	1.31
-99	No data	2	26	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		1488	638					

Non Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	627	2506	8836	470	-0.0684	0.2025	-0.2690	0.0569	-4.91
5-15	degrees	165	659	2343	119	-0.0118	0.0025	-0.0142	0.0665	-0.21
15-30	degrees	115	460	1694	35	0.3594	-0.0435	0.4030	0.0906	4.45
30-45	degrees	19	76	301	13	2.2862	-0.0208	2.3070	0.5187	4.45
>45	degrees	1	2	12	1	0.0000	-0.0033	0.0000	0.0000	0.00
-99	No data	2	28		0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		13188	638					

Landform

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	6081	24326	503	630	0.1383	-0.2207	0.3590	0.0767	4.68
2	Piedmont	2099	8396	178	232	0.1638	-0.0447	0.2085	0.0864	2.41
2	Mountain	2426	9703	85	111	-0.7326	0.1449	-0.8775	0.1156	-7.59
	Total	10606		766	973					

Inventoried Landform										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	556	2223	305	394	0.0556	-0.0877	0.1433	0.1006	1.42
2	Piedmont	152	607	118	160	0.4733	-0.1144	0.5877	0.1167	5.04
2	Mountain	220	880	62	84	-0.6849	0.1557	-0.8406	0.1419	-5.92
	Total	928		485	638					
Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	556	8894	899	394	0.0090	-0.0136	0.0226	0.0559	0.40
2	Piedmont	152	2427	344	160	0.3932	-0.0933	0.4865	0.0660	7.38
2	Mountain	220	3519	245	84	-0.3983	0.1014	-0.4997	0.0727	-6.87
	Total	928		1488	638					
Non Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	556	8894	7877	394	-0.0463	0.0726	-0.1189	0.0542	-2.19
2	Piedmont	152	2427	2078	160	-0.3102	0.0703	-0.3805	0.0649	-5.86
2	Mountain	220	3519	3257	84	0.4257	-0.1074	0.5332	0.0704	7.58
	Total	928		13212	638					

Chi-square

Ruby Vegetation			
Points on 250m grid			
	Site	Not Site	ROW
Meadow	64	192	256
Other veg	1414	12924	14338
COL	1478	13116	14594
Expected values			
	Site	Not Site	
Meadow	25.93	230.07	
Other veg	1452.07	12885.93	
Cell chi values			
	Site	Not Site	
Meadow	38.07	-38.07	
Other veg	-38.07	38.07	
Chi-squares			
	Site	Not Site	
Meadow	55.91	6.30	
Other veg	1.00	0.11	
63.32	Chi Square		
Cell std. residuals			
	Site	Not Site	
Meadow	7.48	-2.51	
Other veg	-1.00	0.34	
Cell variance			
	Site	Not Site	
Meadow	0.88	0.10	
Other veg	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
Meadow	7.96	-7.96	
Other veg	-7.96	7.96	
			0.00

Ruby Vegetation			
Points on 250m grid			
	Site	Not Site	ROW
Water	25	151	176
Other veg	1453	12965	14418
COL	1478	13116	14594
Expected values			
	Site	Not Site	
Water	17.82	158.18	
Other veg	1460.18	12957.82	
Cell chi values			
	Site	Not Site	
Water	7.18	-7.18	
Other veg	-7.18	7.18	
Chi-squares			
	Site	Not Site	
Water	2.89	0.33	
Other veg	0.04	0.00	
3.25	Chi Square		
Cell std. residuals			
	Site	Not Site	
Water	1.70	-0.57	
Other veg	-0.19	0.06	
Cell variance			
	Site	Not Site	
Water	0.88	0.10	
Other veg	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
Water	1.81	-1.81	
Other veg	-1.50	1.50	
			0.00

Ruby Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
1000-2000	188	1218	1406
0-1000,>2000	1300	11994	13294
COL	1488	13212	14700
Expected values			
	Site	Not Site	
1000-2000	142.32	1263.68	
0-1000,>2000	1345.68	11948.32	
Cell chi values			
	Site	Not Site	
1000-2000	45.68	-45.68	
0-1000,>2000	-45.68	45.68	
Chi-squares			
	Site	Not Site	
1000-2000	14.66	1.65	
0-1000,>2000	1.55	0.17	
18.04	Chi Square		
Cell std. residuals			
	Site	Not Site	
1000-2000	3.83	-1.28	
0-1000,>2000	-1.25	0.42	
Cell variance			
	Site	Not Site	
1000-2000	0.88	0.09	
0-1000,>2000	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
1000-2000	4.08	-4.21	
0-1000,>2000	-9.92	10.25	
			0.20

Ruby Wetland			
Points on 250m grid			
	Site	Not Site	ROW
0-1000	436	2599	3035
>1000	1052	10613	11665
COL	1488	13212	14700
Expected values			
	Site	Not Site	
0-1000	307.22	2727.78	
>1000	1180.78	10484.22	
Cell chi values			
	Site	Not Site	
0-1000	128.78	-128.78	
>1000	-128.78	128.78	
Chi-squares			
	Site	Not Site	
0-1000	53.99	6.08	
>1000	14.05	1.58	
75.69	Chi Square		
Cell std. residuals			
	Site	Not Site	
0-1000	7.35	-2.47	
>1000	-3.75	1.26	
Cell variance			
	Site	Not Site	
0-1000	0.88	0.09	
>1000	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
0-1000	7.82	-8.08	
>1000	-29.88	30.86	
			0.74

Ruby Slope			
Points on 250m grid			
	Site	Not Site	ROW
0-5	1057	8836	9893
Not 0-5 degree	429	4350	4779
COL	1486	13186	14672
Expected values			
	Site	Not Site	
0-5	1001.98	8891.02	
Not 0-5 degree	484.02	4294.98	
Cell chi values			
	Site	Not Site	
0-5	55.02	-55.02	
Not 0-5 degree	-55.02	55.02	
Chi-squares			
	Site	Not Site	
0-5	3.02	0.34	
Not 0-5 degree	6.26	0.70	
10.32	Chi Square		
Cell std. residuals			
	Site	Not Site	
0-5	1.74	-0.58	
Not 0-5 degree	-2.50	0.84	
Cell variance			
	Site	Not Site	
0-5	0.88	0.09	
Not 0-5 degree	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
0-5	1.85	-1.90	
Not 0-5 degree	-19.93	20.41	
			0.44

Ruby Slope			
Points on 250m grid			
	Site	Not Site	ROW
5-15 degree	305	2343	2648
0-5, >15 degree	1181	10843	12024
COL	1486	13186	14672
Expected values			
	Site	Not Site	
5-15 degree	268.19	2379.81	
0-5, >15 degree	1217.81	10806.19	
Cell chi values			
	Site	Not Site	
5-15 degree	36.81	-36.81	
0-5, >15 degree	-36.81	36.81	
Chi-squares			
	Site	Not Site	
5-15 degree	5.05	0.57	
0-5, >15 degree	1.11	0.13	
6.86	Chi Square		
Cell std. residuals			
	Site	Not Site	
5-15 degree	2.25	-0.75	
0-5, >15 degree	-1.05	0.35	
Cell variance			
	Site	Not Site	
5-15 degree	0.88	0.08	
0-5, >15 degree	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
5-15 degree	2.39	-2.45	
0-5, >15 degree	-8.40	8.61	
			0.15

Ruby Landform			
Points on 250m grid			
	Site	Not Site	ROW
Piedmont	344	2078	2422
Not Flat	1144	11134	12278
COL	1488	13212	14700
Expected values			
	Site	Not Site	
Piedmont	245.17	2176.83	
Not Flat	1242.83	11035.17	
Cell chi values			
	Site	Not Site	
Piedmont	98.83	-98.83	
Not Flat	-98.83	98.83	
Chi-squares			
	Site	Not Site	
Piedmont	39.84	4.49	
Not Flat	7.86	0.89	
53.08	Chi Square		
Cell std. residuals			
	Site	Not Site	
Piedmont	6.31	-2.12	
Not Flat	-2.80	0.94	
Cell variance			
	Site	Not Site	
Piedmont	0.88	0.09	
Not Flat	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
Piedmont	6.72	-6.84	
Not Flat	-22.34	23.08	
			0.52

Ruby Landform			
Points on 250m grid			
	Site	Not Site	ROW
Flat	899	7877	8776
Not Flat	589	5335	5924
COL	1488	13212	14700
Expected values			
	Site	Not Site	
Flat	888.35	7887.65	
Not Flat	599.65	5324.35	
Cell chi values			
	Site	Not Site	
Flat	10.65	-10.65	
Not Flat	-10.65	10.65	
Chi-squares			
	Site	Not Site	
Flat	0.13	0.01	
Not Flat	0.19	0.02	
0.35	Chi Square		
Cell std. residuals			
	Site	Not Site	
Flat	0.36	-0.12	
Not Flat	-0.44	0.15	
Cell variance			
	Site	Not Site	
Flat	0.88	0.09	
Not Flat	0.02	0.00	
Adj. std. residuals			
	Site	Not Site	
Flat	0.38	-0.39	
Not Flat	-3.47	3.58	
			0.10

Figure 5.15 Ruby/Long Valley Analytic Unit Predictive Pattern - Vegetation

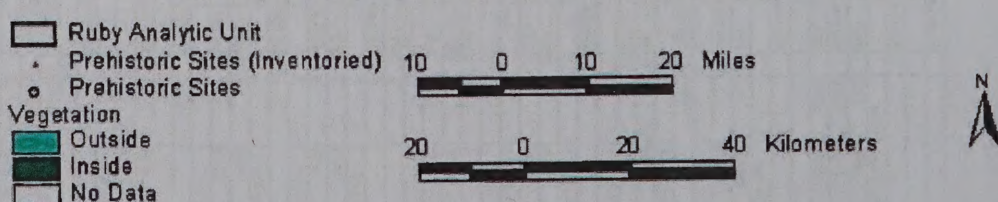


Figure 5.16 Ruby/Long Valley Analytic Unit Predictive Pattern - Streams and Springs

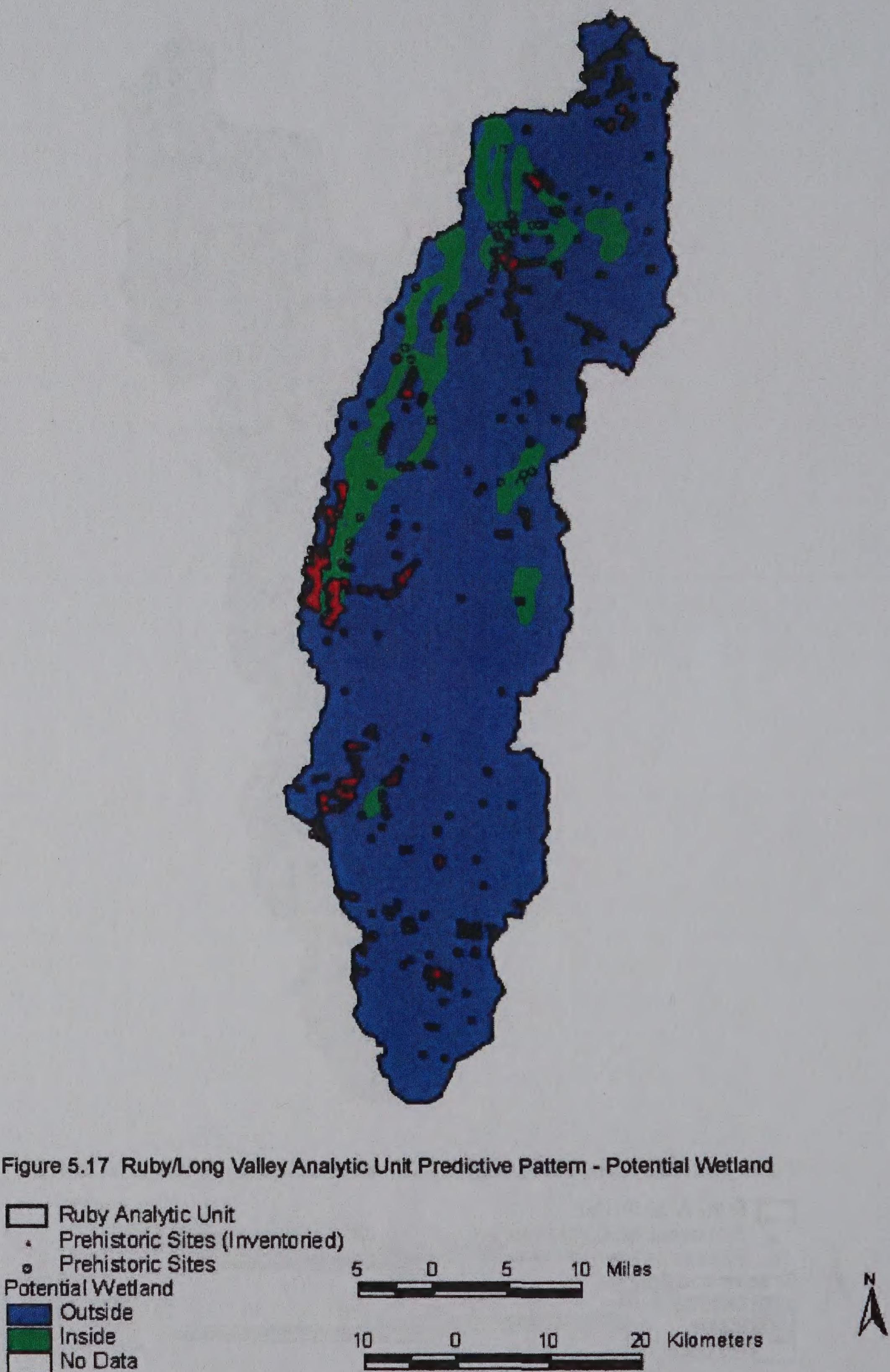


Figure 5.17 Ruby/Long Valley Analytic Unit Predictive Pattern - Potential Wetland

Figure 5.18 Ruby/Long Valley Analytic Unit Predictive Pattern - Slope

Ruby Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Slope
Outside
Inside
No Data

5 0 5 10 Miles

10 0 10 20 Kilometers

N

Figure 5.19 Ruby/Long Valley Analytic Unit Predictive Pattern - Landform

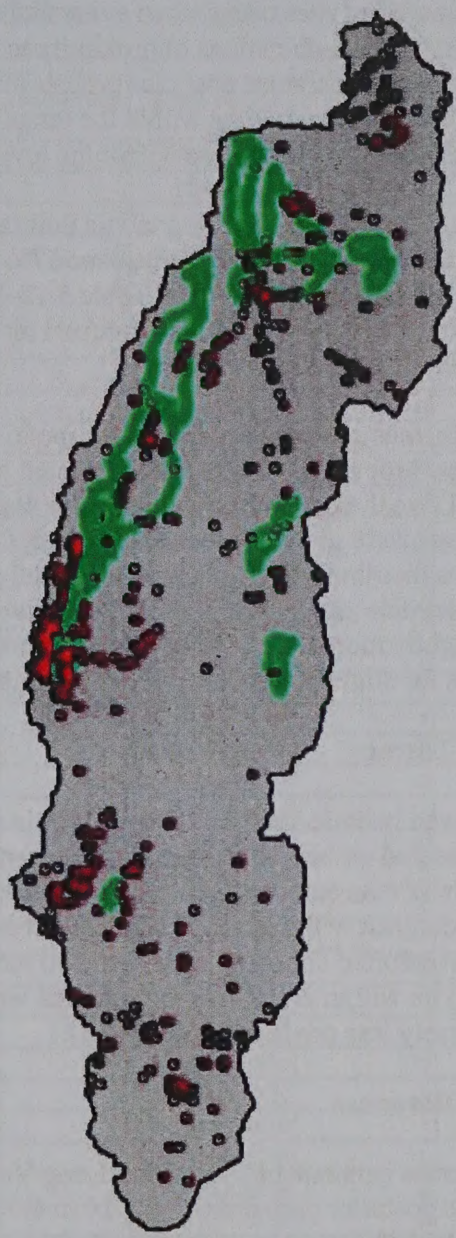


Figure 5.20 Ruby/Long Valley Analytic Unit Observed Probability - Prehistoric

posterior probability were set at 0.182 and 0.0033. (Table 5.11) (Figure 5.21) Highest probabilities for encountering sites occur when evidential classes identified as inside the predictive pattern intersect. Combinations of proximity to wetlands, springs and streams, vegetation, and slope have the highest posterior probabilities, but combinations of three or more evidential themes are also common within the range of moderate probabilities and two or more combinations of evidential themes within the low probability area.

Summary tables for the Ruby/Long Valley analytic unit response theme shows that while 33% of the area is classified as low probability, over 57% of the sites occur within that zone. A similar pattern occurs for inventoried sites. Table 5.12 The higher frequency of training points within the low probability area creates a normal distribution and with it, a posterior probability lower than the prior distribution.

To realign response themes so that they better correspond with predictive patterns within evidential themes, new probability areas were calculated by totaling binary theme values of each theme. Since all five themes contained predictive classes, additive scores ranged from 0 to 5. Probability classes were grouped into three classes, 0-1 low, 2 medium, and 3-5 high. (Table 5.13) Site area distributions within newly defined probability zones provide a better fit of the data. Site densities are highest in the high probability zones and lowest in low probability areas. Slightly more than 11% of the site area occurs within the low probability zone, which accounts for slightly less than 20% of the analytic unit. (Figure 5.22)

Historic Evidential Themes

One hundred fifty-seven historic sites are reported within the Ruby/Long Valley analytic unit and 81 of these are located within 640 acre or larger inventory units. (Table 5.9) (Figure 5.23) The area within 200 meters of roads, and within 200 meters of streams or springs, revealed the highest contrast within historic evidential themes. (Figure 5.24) (Figure 5.25) Nearly 75% of the inventoried sites (61) lie within 200 meters of roads, while 32% of inventoried sites (26) lie within 200 meters of potential water sources. Distances greater than 200 meters are uniformly less predictive. (Table 5.14)

Historic Predictive Response

Historic response themes generated for the Ruby/Long Valley analytic unit show three possible breaks in the posterior probabilities; 0.014 to 0.008, 0.008 to 0.003 and 0.003 to 0.0009, with a prior probability set at 0.003. (Table 5.15) (Figure 5.26) Lower relative contrasts for proximity of sites to potential water sources create a cluster of training points with posterior probabilities below the prior expected value. Summary tables show that the resulting probability map meets expectations for site density in the low probability area. Seventy-five percent of the analytic unit comprises the low sensitivity zone, and 25% of the sites fall within this area. (Table 5.16). Fourteen training points associated with proximity to water are associated with the low probability zone. The medium probability zone is relatively small and contains a single set of training points associated only with proximity to roads. (Figure 5.27)

Table 5.11
[illegible]y/Long Valley Analytic Unit Prehistoric Response

VALUE	WETLAND	WATER	VEGETATION	SLOPE	LANDFORM	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
42	1	1	1	1	0	3417630.67	3	0.50376173	0.48772786	High
39	1	0	1	1	0	12094644.18	6	0.47949831	0.46423670	
41	0	1	1	1	0	1224359.30	7	0.20418297	0.19768418	
40	0	0	1	1	0	2251361.41	0	0.18885722	0.18284622	
38	1	1	0	1	1	256191.97	0	0.07822205	0.07573238	Medium
29	1	0	0	1	1	46903238.67	17	0.07150134	0.06922558	
28	1	1	0	-99	1	90858.78	0	0.06729815	0.06515617	
37	1	1	0	1	0	91795668.28	27	0.06444952	0.06239820	
30	1	0	-99	-99	1	93093.01	0	0.06259953	0.06060709	
25	1	0	0	-99	1	1245956.88	0	0.06145343	0.05949747	
33	1	0	0	1	0	753540272.57	140	0.05883659	0.05696392	
27	1	1	0	-99	0	128840.73	0	0.05533353	0.05357236	
34	1	0	-99	-99	0	76708.64	0	0.05142420	0.04978746	
26	1	0	0	-99	0	589092.58	0	0.05047169	0.04886526	
36	1	1	0	0	1	192888.72	1	0.04468715	0.04326483	
31	1	0	0	0	1	41968564.27	12	0.04072042	0.03942436	
35	1	1	0	0	0	1000191.33	0	0.03658476	0.03542033	
32	1	0	0	0	0	52594573.09	12	0.03331217	0.03225190	
21	0	1	-99	1	1	841560.83	1	0.02140585	0.02072454	Low
17	0	1	0	1	1	70198089.38	5	0.02099705	0.02032875	
10	0	0	-99	1	1	2605859.61	0	0.01946362	0.01884413	
6	0	0	0	1	1	809804199.83	71	0.01909119	0.01848355	
14	0	1	-99	-99	1	525789.33	0	0.01825930	0.01767814	
13	0	1	0	-99	1	1051578.67	0	0.01790949	0.01733946	
24	0	1	-99	1	0	872840.09	1	0.01744758	0.01689225	
23	0	1	0	1	0	769191069.83	44	0.01711305	0.01656837	
11	0	0	-99	-99	1	5588559.73	0	0.01659772	0.01606944	
2	0	0	0	-99	1	15382689.39	1	0.01627922	0.01576108	
8	0	0	-99	1	0	3708080.87	0	0.01585868	0.01535393	
5	0	0	0	1	0	4453119147.82	272	0.01555413	0.01505907	
18	0	1	-99	-99	0	2676610.30	0	0.01487403	0.01440062	
15	0	1	0	-99	0	5235551.02	1	0.01458811	0.01412380	
12	0	0	-99	-99	0	17260934.01	0	0.01351627	0.01308607	
1	0	0	0	-99	0	50682070.24	6	0.01325610	0.01283418	
20	0	1	-99	0	1	1397884.68	0	0.01191403	0.01153483	
16	0	1	0	0	1	89433339.99	3	0.01168434	0.01131245	
9	0	0	-99	0	1	5085857.46	0	0.01082350	0.01047901	
4	0	0	0	0	1	1006273651.36	67	0.01061461	0.01027677	
19	0	1	-99	0	0	3856284.95	0	0.00969356	0.00938503	
22	0	1	0	0	0	179056589.73	3	0.00950626	0.00920369	
7	0	0	-99	0	0	30419817.51	0	0.00880447	0.00852424	
3	0	0	0	0	0	2072421749.39	66	0.00863420	0.00835939	

Figure 5.21 Ruby/Long Valley Analytic Unit Response

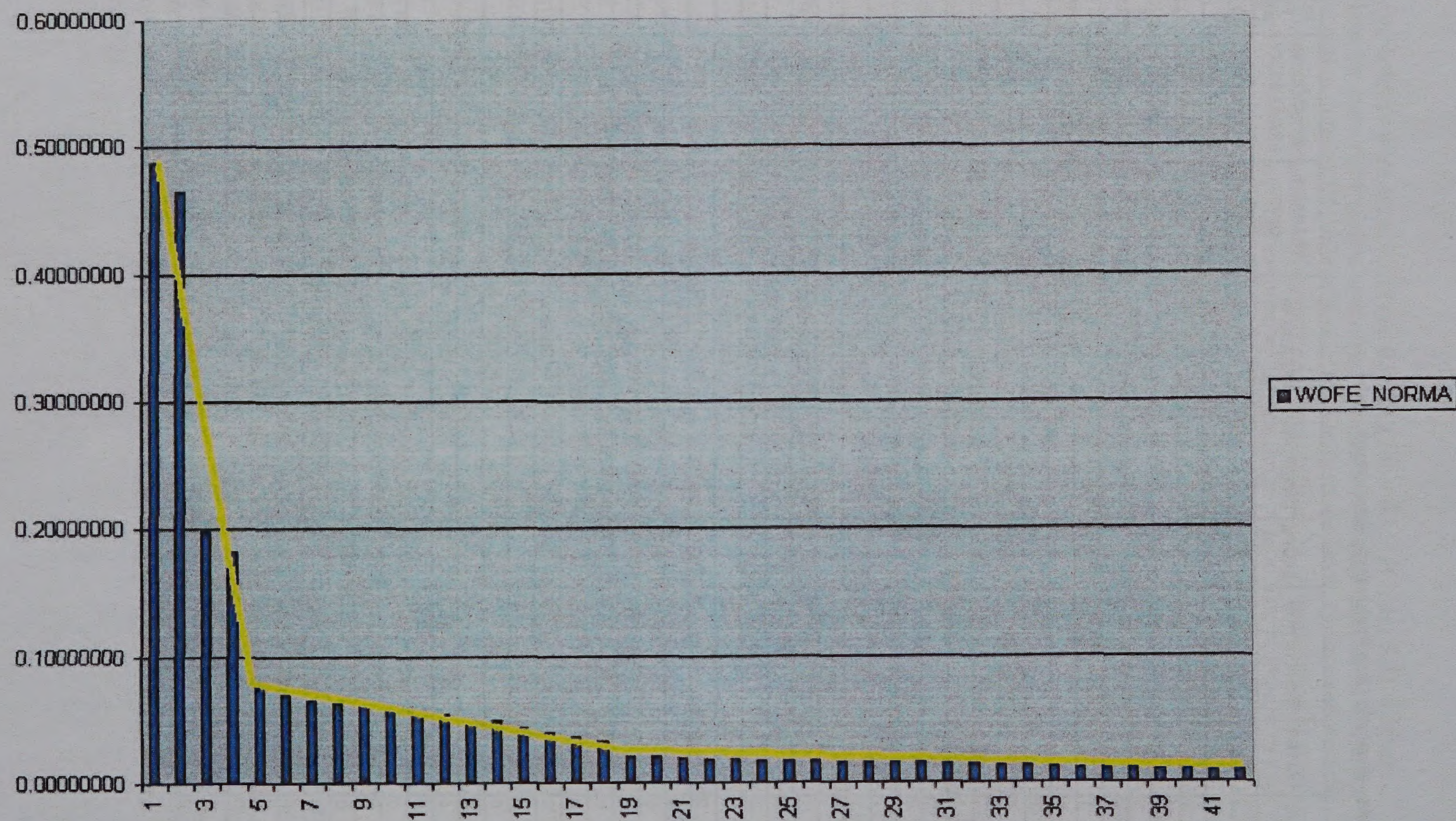


Table 5.12
Ruby/Long Valley Analytic Unit Model Summary Prehistoric Response

	High	Medium	Low	Total
Model area (m^2)	955869370.66	6186484229.80	3463800340.64	10606153941.10
Model area (km^2)	955.87	6186.48	3463.80	10606.15
% Model area	9.01%	58.33%	32.66%	100.00%
All sites area (m^2)	*6467358.00*	*8779043.00*	*20303958.00*	*35550359.00*
All sites area (km^2)	6.47	8.78	20.30	35.55
% Site area	18.19%	24.69%	57.11%	100.00%
All site area / model area	**0.0068**	**0.0014**	**0.0059**	**0.0034**
Inventory area (m^2)	178784016.00	129223528.00	619528768.00	927536312.00
Inventory area (km^2)	178.78	129.22	619.53	927.54
% Inventory area	19.28%	13.93%	66.79%	100.00%
% Model area inventoried	**18.70%**	**2.09%**	**17.89%**	**8.75%**
Inventory sites area (m^2)	5451527.00	4482614.50	10623030.00	20557171.50
Inventory sites area (km^2)	5.45	4.48	10.62	20.56
% Inventory Site area	26.52%	21.81%	51.68%	100.00%
Inv site area / inv area	**0.0305**	**0.0347**	**0.0171**	**0.0222**

Table 5.13
Ruby/Long Valley Analytic Unit Model Summary Prehistoric Composite

	High (5-3)	Medium (2)	Low (1-0)	Total
Model area (m^2)	2693271808.00	5691043840.00	2072421760.00	10456737408.00
Model area (km^2)	2693.27	5691.04	2072.42	10456.74
% Model area	25.76%	54.42%	19.82%	100.00%
All sites area (m^2)	14991699.00	16013488.00	3885330.00	34890517.00
All sites area (km^2)	14.99	16.01	3.89	34.89
% Site area	42.97%	45.90%	11.14%	100.00%
All site area / model area	**0.0056**	**0.0028**	**0.0019**	**0.0033**
Inventory area (m^2)	302547072.00	422390560.00	194816864.00	919754496.00
Inventory area (km^2)	302.55	422.39	194.82	919.75
% Inventory area	32.89%	45.92%	21.18%	100.00%
% Model area inventoried	**11.23%**	**7.42%**	**9.40%**	**8.80%**
Inventory sites area (m^2)	9639968.00	8336665.50	2328814.75	20305448.25
Inventory sites area (km^2)	9.64	8.34	2.33	20.31
% Inventory site area	47.47%	41.06%	11.47%	100.00%
Inv site area / inv area	**0.0319**	**0.0197**	**0.0120**	**0.0221**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

Figure 5.22 Ruby/Long Valley Analytic Unit Composite Probability - Prehistoric

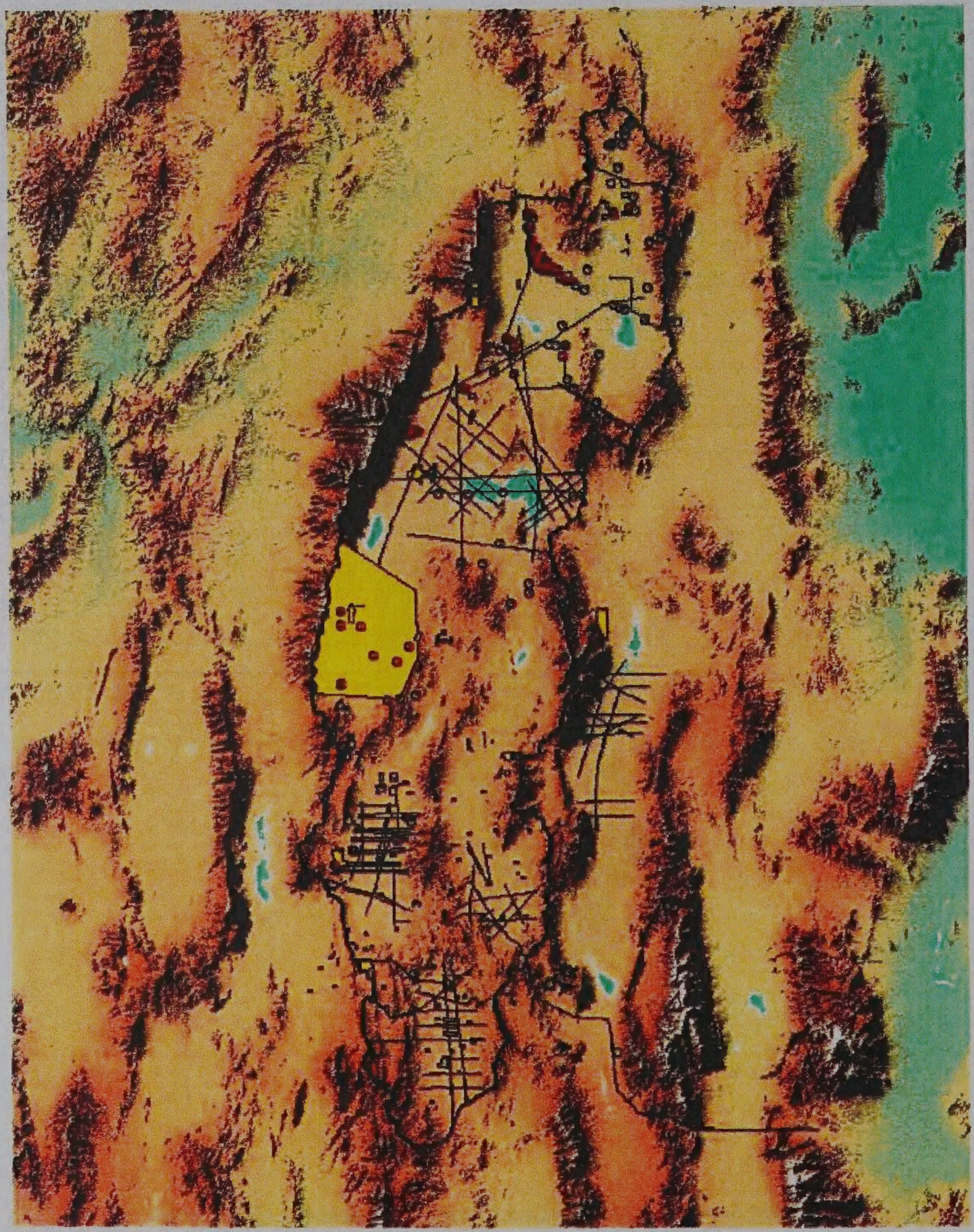


Figure 5.23 Ruby/Long Valley Analytic Unit - Inventories and Historic Sites

Ruby Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Inventories

20 0 20 40 Miles

40 0 40 80 Kilometers

N

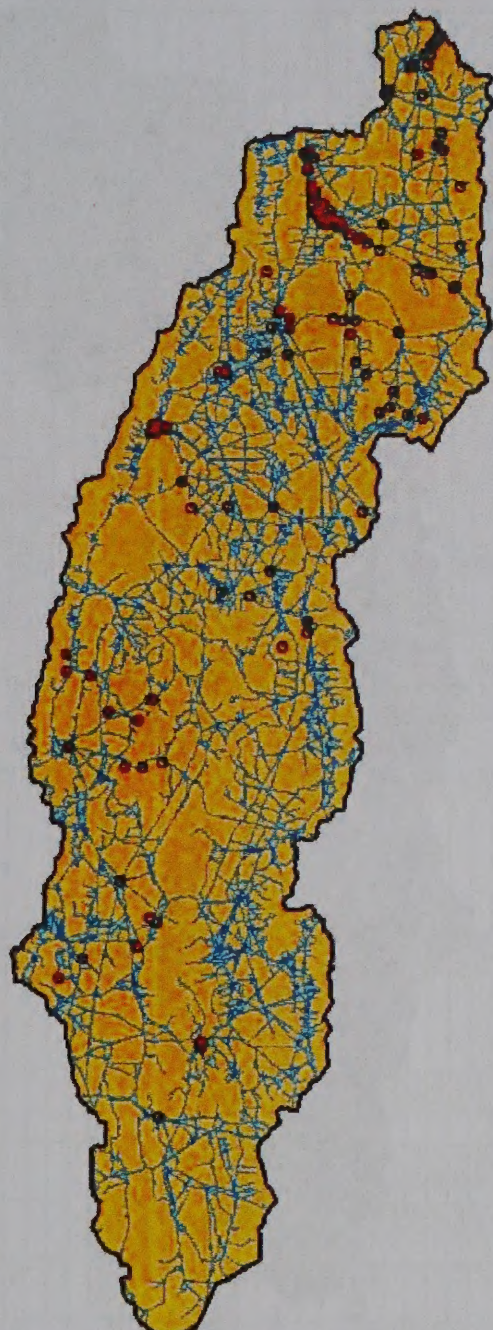


Figure 5.24 Ruby/Long Valley Analytic Unit Predictive Pattern - Roads

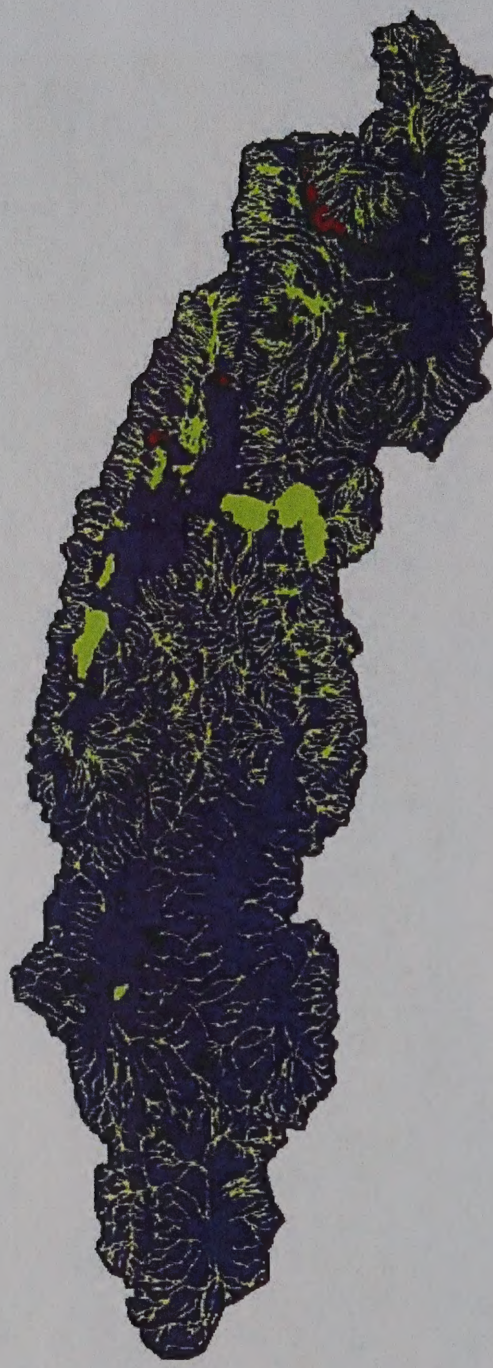


Figure 5.25 Ruby/Long Valley Analytic Unit Predictive Pattern - Water

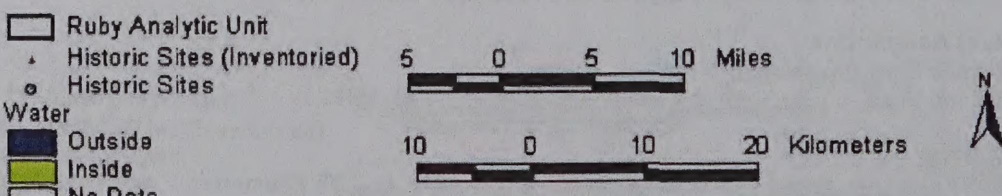


Table 5.14
Ruby/Long Valley Analytic Unit Historic Evidential Theme Weights/Chi-Square

Theme Weight

ALL SITES										
Roads										
CLASS		**Area sq.km**	**500m Cells**	**# Points**	**# Sites**	**W+**	**W-**	**Contrast**	**Contrast std. dev.**	**Normalized Contrast**
200	0-200m	2628	10512	103	118	1.1020	-1.0684	2.1704	0.1939	11.19
400	200-400m	1953	7813	19	20	-0.2989	0.0567	-0.3557	0.2472	-1.44
600	400-600m	1459	5835	8	8	-0.8732	0.0890	-0.9622	0.3645	-2.64
800	600-800m	1098	4390	3	4	-1.5701	0.0877	-1.6578	0.5839	-2.84
1000	800-1000m	832	3330	1	2	-2.3927	0.0748	-2.4675	1.0038	-2.46
9999	>1000m	2636	10544	5	5	-1.9357	0.2500	-2.1857	0.4556	-4.80
-99	Missing data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	10606		139	157					
Inventoried Roads										
CLASS		**Area sq.km**	**500m Cells**	**# Points**	**# Sites**	**W+**	**W-**	**Contrast**	**Contrast std. dev.**	**Normalized Contrast**
200	0-200m	248	992	51	61	1.0510	-1.0448	2.0958	0.2768	7.57
400	200-400m	177	706	11	11	-0.1806	0.0383	-0.2189	0.3318	-0.66
600	400-600m	131	525	3	3	-1.1928	0.1102	-1.3031	0.5922	-2.20
800	600-800m	96	385	2	3	-1.2888	0.0817	-1.3705	0.7196	-1.90
1000	800-1000m	70	280	1	2	-1.6663	0.0652	-1.7315	1.0092	-1.72
9999	>1000m	205	822	1	1	-2.7444	0.2409	-2.9853	1.0081	-2.96
-99	Missing data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		69	81					
Site 250 Grid Roads										
CLASS		**Area sq.km**	**250m Cells**	**# Points**	**# Sites**	**W+**	**W-**	**Contrast**	**Contrast std. dev.**	**Normalized Contrast**
200	0-200m	248	3967	171	61	1.1485	-1.4044	2.5529	0.1803	14.16
400	200-400m	177	2826	19	11	-0.7467	0.1177	-0.8643	0.2415	-3.58
600	400-600m	131	2099	7	3	-1.4516	0.1203	-1.5718	0.3852	-4.08
800	600-800m	96	1540	7	3	-1.1403	0.0766	-1.2169	0.3854	-3.16
1000	800-1000m	70	1121	2	2	-2.0785	0.0700	-2.1485	0.7112	-3.02
9999	>1000m	205	3287	3	1	-2.7497	0.2398	-2.9895	0.5819	-5.14
-99	Missing data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		209	81					
Non Site 250 Grid Roads										
CLASS		**Area sq.km**	**250m Cells**	**# Points**	**# Sites**	**W+**	**W-**	**Contrast**	**Contrast std. dev.**	**Normalized Contrast**
200	0-200m	248	3967	3794	61	-0.6382	0.3809	-1.0191	0.1086	-9.38
400	200-400m	177	2826	2757	11	-0.0301	0.0072	-0.0373	0.1364	-0.27
600	400-600m	131	2099	2082	3	1.0605	-0.1041	1.1645	0.2471	4.71
800	600-800m	96	1540	1506	3	0.0726	-0.0081	0.0807	0.1830	0.44
1000	800-1000m	70	1121	1107	2	0.6372	-0.0382	0.6754	0.2735	2.47
9999	>1000m	205	3287	3245	1	0.6115	-0.1240	0.7355	0.1649	4.46
-99	Missing data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	927		14491	81					

Chi-Square

Ruby Roads			
Points on 250m grid			
	Site	Not Site	ROW
0-200	171	3794	3965
Other veg	38	10697	10735
COL	209.00	14491	14700
Expected values			
	Site	Not Site	
0-200	56.37	3908.63	
Other veg	152.63	10582.37	
Cell chi values			
	Site	Not Site	
0-200	114.63	-114.63	
Other veg	-114.63	114.63	
Chi-squares			
	Site	Not Site	
0-200	233.08	3.36	
Other veg	86.09	1.24	
323.77	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
0-200	15.27	-1.83	
Other veg	-9.28	1.11	
Cell variance			
	Site	Not Site	
0-200	0.73	0.00	
Other veg	0.26	0.00	
Adj. std. residuals			
	Site	Not Site	
0-200	17.90	NA	
Other veg	-18.27	NA	
			NA

Ruby Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
0-200	99	4427	4526
>400	110	10064	10174
COL	209	14491	14700
Expected values			
	Site	Not Site	
0-200	64.35	4461.65	
>400	144.65	10029.35	
Cell chi values			
	Site	Not Site	
0-200	34.65	-34.65	
>400	-34.65	34.65	
Chi-squares			
	Site	Not Site	
0-200	18.66	0.27	
>400	8.30	0.12	
27.36	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
0-200	4.32	-0.52	
>400	-2.88	0.35	
Cell variance			
	Site	Not Site	
0-200	0.73	0.00	
>400	0.26	0.00	
Adj. std. residuals			
	Site	Not Site	
0-200	5.06	NA	
>400	-5.67	NA	
			NA

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	3082	12327	56	63	0.3281	-0.1729	0.5010	0.1733	2.89
400	200-400m	2354	9417	33	37	0.0675	-0.0201	0.0876	0.1997	0.44
1000	400-1000m	3430	13720	38	44	-0.1685	0.0715	-0.2400	0.1906	-1.26
9999	>1000m	1740	6961	12	13	-0.6437	0.0892	-0.7330	0.3023	-2.42
	Total	10606		139	157					

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	1146	23	26	0.0773	-0.0365	0.1138	0.2579	0.44
400	200-400m	210	839	18	21	0.1453	-0.0466	0.1919	0.2770	0.69
1000	400-1000m	302	1207	24	29	0.0678	-0.0344	0.1022	0.2552	0.40
9999	>1000m	129	517	4	5	-0.8878	0.0921	-0.9799	0.5174	-1.89
	Total	927		69	81					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	4586	99	26	0.4349	-0.2756	0.7105	0.1397	5.09
400	200-400m	210	3358	50	21	0.0566	-0.0172	0.0738	0.1633	0.45
1000	400-1000m	302	4830	50	29	-0.3115	0.1221	-0.4336	0.1631	-2.66
9999	>1000m	129	2067	10	5	-1.0780	0.1025	-1.1806	0.3249	-3.63
	Total	927		209	81					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	287	4586	4427	26	-0.3960	0.2404	-0.6364	0.1089	-5.84
400	200-400m	210	3358	3344	21	1.7747	-0.2225	1.9972	0.2766	7.22
1000	400-1000m	302	4830	4727	29	0.1043	-0.0468	0.1511	0.1187	1.27
9999	>1000m	129	2067	1993	5	-0.4377	0.0916	-0.5293	0.1328	-3.99
	Total	927		14491	81					

Table 5.15
Ruby\Long Valley Analytic Unit Historic Response

VALUE	HISTORIC WATER	ROADS	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBBILITY
4	1	1	947938590.76	42	0.01355131	0.01322698
3	0	1	1680034701.71	61	0.00825515	0.00805758
5	1	-99	5957.95	0	0.00454294	0.00443421
6	0	-99	11915.91	0	0.00275761	0.00269161
2	1	0	2133732062.68	14	0.00156543	0.00152796
1	0	0	5844430712.09	22	0.00094912	0.00092640

Figure 5.26 Ruby/Long Valley Analytic Unit Historic Response

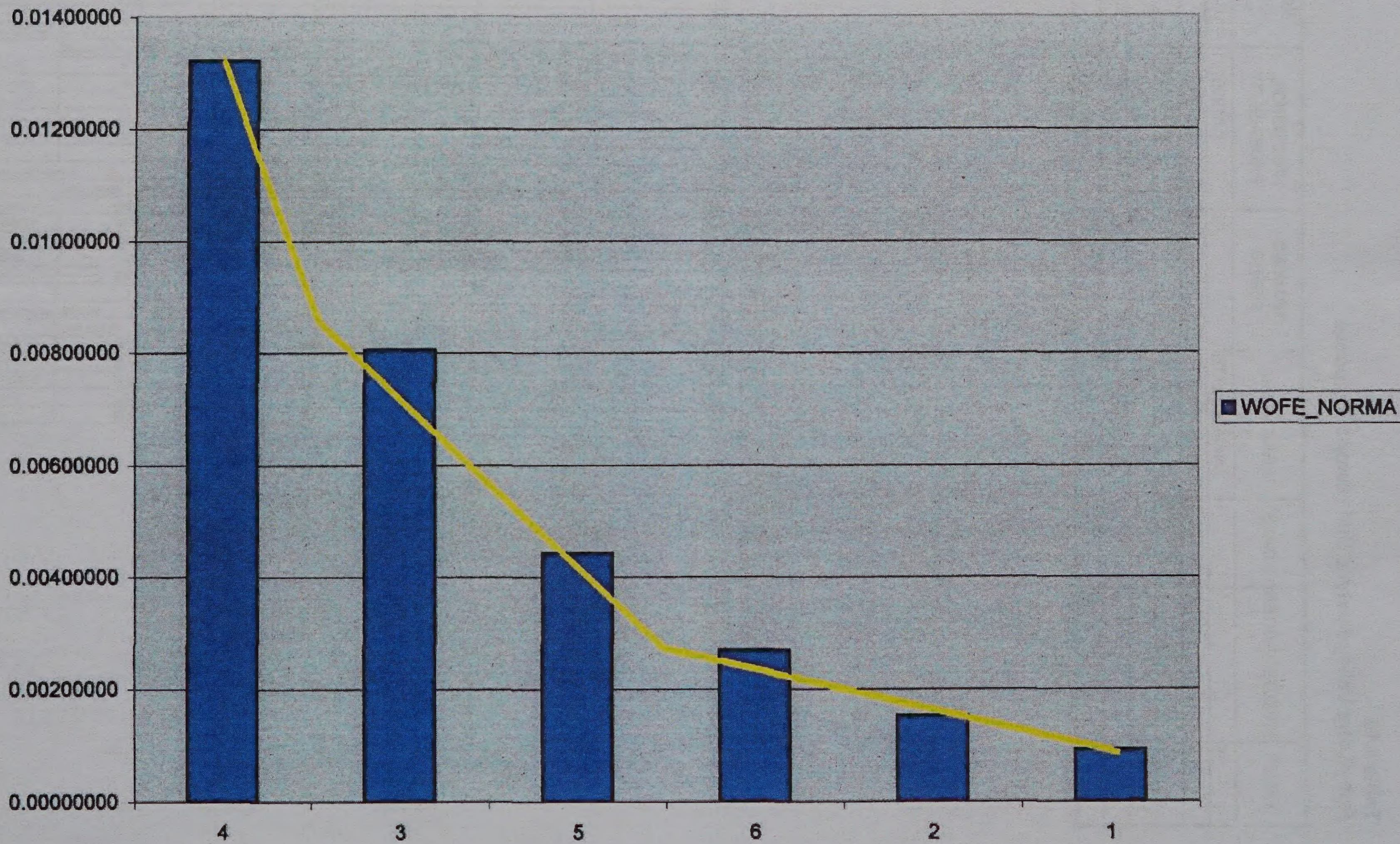


Table 5.16

Ruby/Long Valley Analytic Unit Model Summary Historic Response

	High	Medium	Low	Total
Model area (m^2)	947938560.00	1680034688.00	7978180608.00	10606153856.00
Model area (km^2)	947.94	1680.03	7978.18	10606.15
% Model area	8.94%	15.84%	75.22%	100.00%
All sites area (m^2)	1735253.75	1968358.63	943590.75	4647203.13
All sites area (km^2)	1.74	1.97	0.94	4.65
% Site area	37.34%	42.36%	20.30%	100.00%
All site area / model area	**0.0018**	**0.0012**	**0.0001**	**0.0004**
Inventory area (m^2)	87420296.00	160533312.00	679582720.00	927536328.00
Inventory area (km^2)	87.42	160.53	679.58	927.54
% Inventory area	9.42%	17.31%	73.27%	100.00%
% Model area inventoried	**9.22%**	**9.56%**	**8.52%**	**8.75%**
Inventory sites area (m^2)	792407.75	962209.38	582389.88	2337007.00
Inventory sites area (km^2)	0.79	0.96	0.58	2.34
% Inventory site area	33.91%	41.17%	24.92%	100.00%
Inv site area / Inv area	**0.0091**	**0.0060**	**0.0009**	**0.0025**

Ruby/Long Valley Analytic Unit Model Summary Historic Composite

	High (2)	Medium (1)	Low (0)	Total
Model area (m^2)	947938560.00	3813766656.00	5844430848.00	10606136064.00
Model area (km^2)	947.94	3813.77	5844.43	10606.14
% Model area	8.94%	35.96%	55.10%	100.00%
All sites area (m^2)	1735253.75	2366796.75	545152.69	4647203.19
All sites area (km^2)	1.74	2.37	0.55	4.65
% Site area	37.34%	50.93%	11.73%	100.00%
All site area / model area	**0.0018**	**0.0006**	**0.0001**	**0.0004**
Inventory area (m^2)	87420296.00	359717344.00	480397184.00	927534824.00
Inventory area (km^2)	87.42	359.72	480.40	927.53
% Inventory area	9.43%	38.78%	51.79%	100.00%
% Model area inventoried	**9.22%**	**9.43%**	**8.22%**	**8.75%**
Inventory sites area (m^2)	792407.75	1185632.63	358966.66	2337007.03
Inventory sites area (km^2)	0.79	1.19	0.36	2.34
% Inventory site area	33.91%	50.73%	15.36%	100.00%
Inv site area / Inv area	**0.0091**	**0.0033**	**0.0007**	**0.0025**

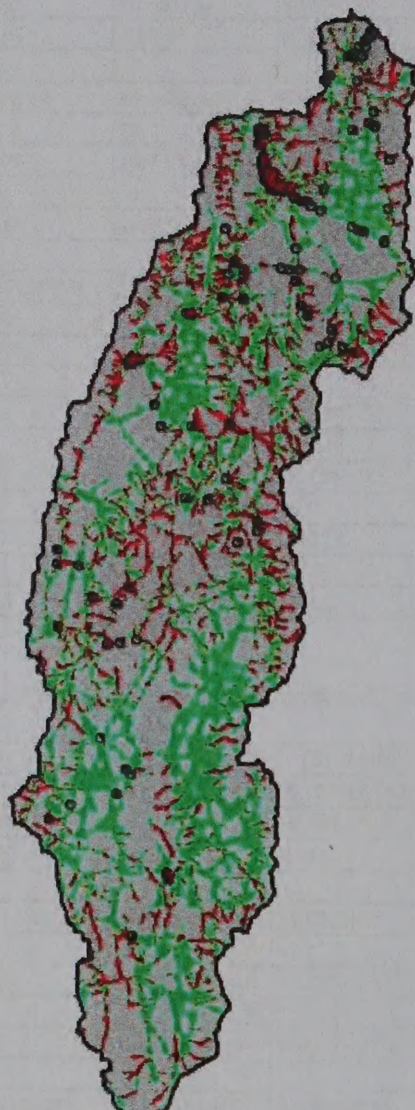


Figure 5.27 Ruby/Long Valley Analytic Unit Observed Probability - Historic

Using similar methods employed to clarify the prehistoric predictive response, the historic response theme was re-classified using only the intersection of predictive evidential classes. A more balanced distribution is evident within the reclassification. (Table 5.16) Forty three percent of the analytic unit is classified as high or medium probability, with 84% of the inventoried site area falling into that classification. Sites falling within 200 meters of water previously associated with the low probability zone are now included within the medium classification. (Figure 5.28)

SPRING/STEPTOE VALLEY ANALYTIC UNIT

Analytic Unit Description

The Spring/Steptoe Valley analytic unit lies to the east of the Ruby/Long Valley analytic unit and includes Spring Valley and Steptoe Valley to the south, and Goshute Valley and Antelope Valley to the north. The analytic unit covers approximately 3.4 million acres (5323 mi^2)/1.3 million hectares (13787 km^2). (Figure 5.29) Topography is typical of north-trending grabens within the Great Basin. High bounding ranges create an orthographic effect on precipitation patterns depositing more moisture along west-facing slopes. Steeply faulted bounding ranges produce numerous springs along eastern pediment slopes.

Steptoe Creek and Duck Creek are the major hydrologic features along the western side of the analytic unit. Both drain northward into Goshute Lake at the southern end of Goshute Valley. Spring Valley Creek is the major drainage in the eastern portion of the analytic unit. It flows north through Spring Valley, then terminates in a large depression and dune field south of Spring Creek Flat. Antelope Valley is relatively dry. Drainages flow from the surrounding mountains to the valley floor. Numerous spring complexes occur within Spring Valley, especially along the toe of western piedmont slopes. Marshes and ponds are present in Steptoe Valley along Steptoe Creek southeast of Ely and west of McGill.

Elevations of the valley floors within the Spring/Steptoe analytic unit are relatively high, ranging from 1900 meters in the south to 1750 meters in the north. The Pequop Mountains and Toano Range bound the hydrographic unit in the north, Cherry Creek and Egan Range on the west and the Snake Range and Ferber Hills to the east. The Schell Creek Range separates Steptoe and Spring Valleys. Wheeler Peak (3952 meters) in the Snake Range is the highest peak within the analytic unit. Mountain elevations are highest in the southern portion of the analytic unit, averaging 3500 meters. Northern ranges average approximately 2500 meters in elevation.

Vegetation is typical of the Great Basin. Highest elevations are dominated by alpine vegetation including limber and bristlecone pine; juniper/pinyon forest covers more temperate lower slopes. The sagebrush zone dominates open pediment slopes and is replaced by desert shrub communities on the lower flats. Depressions and valley bottoms are sparsely vegetated.

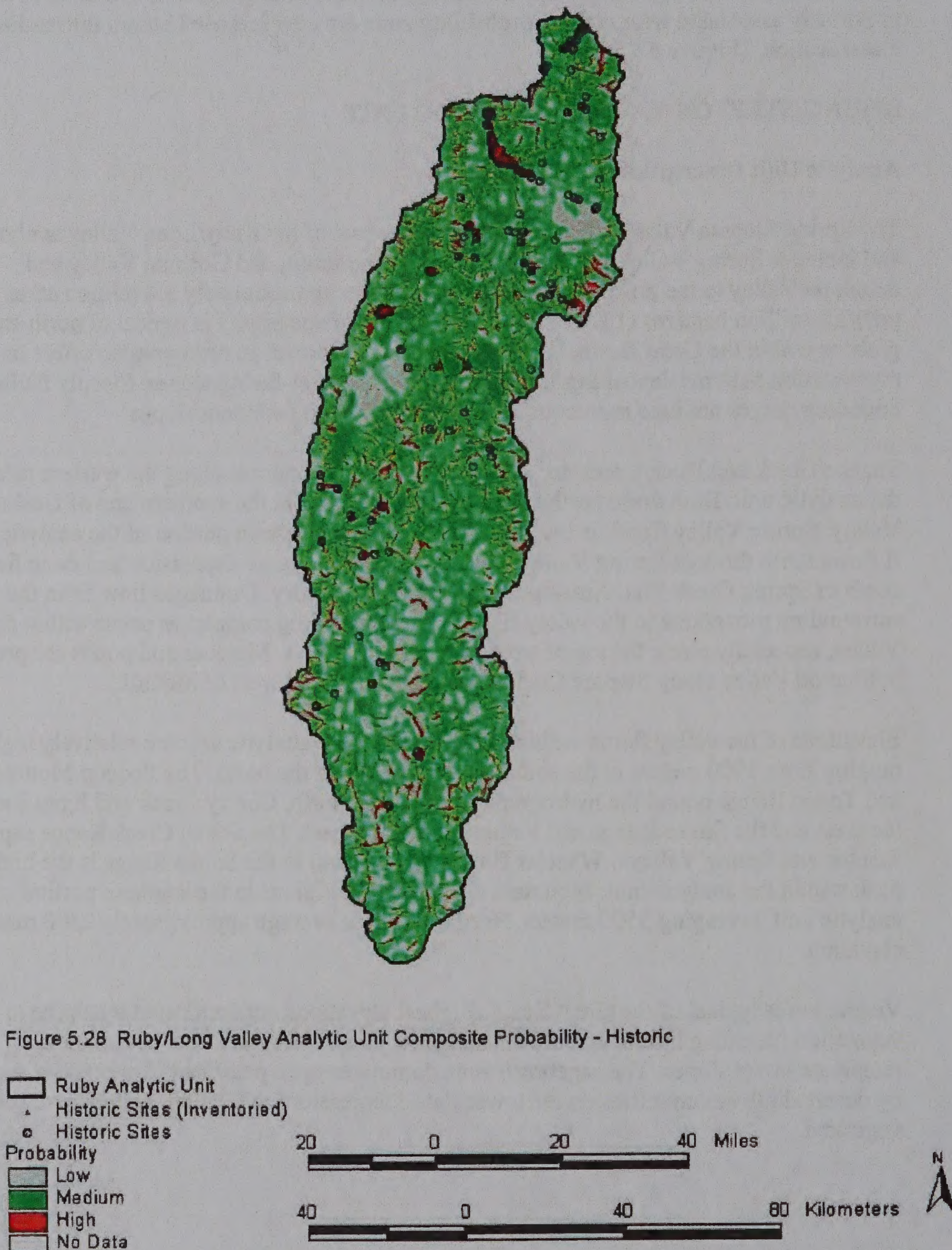


Figure 5.28 Ruby/Long Valley Analytic Unit Composite Probability - Historic

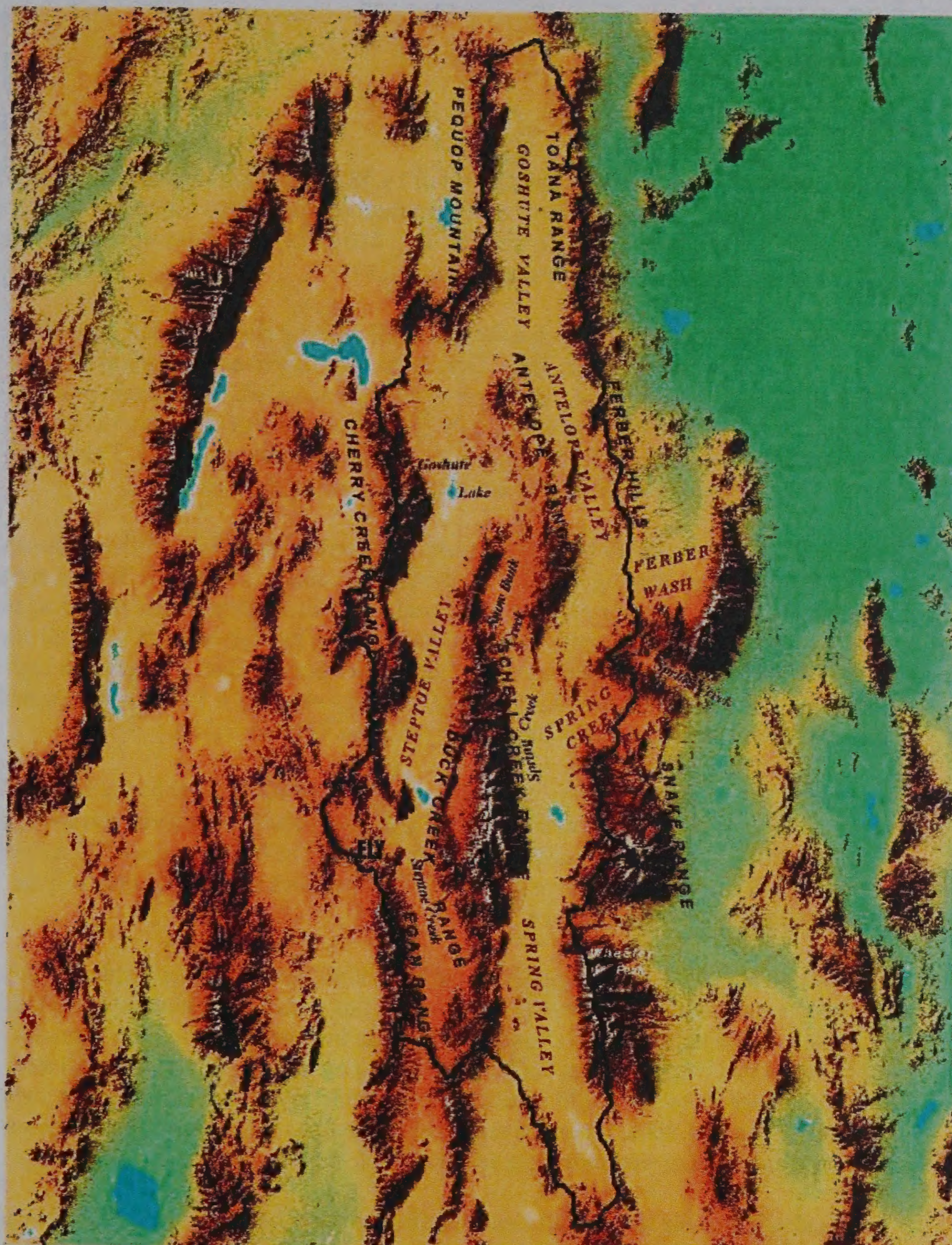
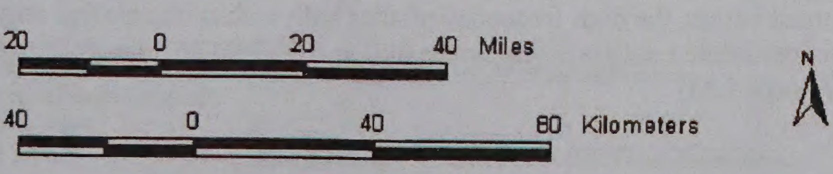


Figure 5.29 Spring/Steptoe Valley Analytic Unit



Analytic Results

Prehistoric Evidential Themes

Approximately 387 square kilometers (2.8%) of 13,787 square kilometers within the entire Spring/Steptoe Valley analytic unit were inventoried. (Figure 5.30) Eight hundred twenty three sites were identified within the analytic unit; 410 (50%) of those were recorded in inventories larger than 640 acres in extent. Table 5.17

Larger surveys have occurred within a sample of all analytic classes within the analytic unit. However, vegetation zones within Great Basin pine, and barren areas along with mountain landforms and slopes greater than 15 degrees are under sampled. Great Basin pine and barren vegetation zones respectively comprises 0.9% and 1.2% of the of the entire model area. Approximately 28% of the analytic unit comprises the mountain landform. Thirty-nine percent of the analytic unit consists of slope greater than 15 degrees.

Evidential theme classes with highest contrasts and correspondingly significant chi-square results were identified as lying "inside" the predictive pattern. Table 5.18 Highest contrast for vegetation within inventoried sites was associated with sagebrush, and the associated chi-square was also considered significant. Sagebrush retains its high contrast when all sites are considered. A high negative contrast within the juniper/pinyon class along with a high positive contrast for non-sites within that class strongly suggests a lower than expected relationship between sites and the juniper/pinyon zone. (Figure 5.31)

Highest contrast for distance to water is within the 1000 to 2000 meter buffer band. While greater numbers of sites are located between 0 and 1000 meters of streams and springs, their numbers reflect a normal distribution in relation to area. The band between 200 and 400 meters shows the strongest negative contrast with fewer sites than would normally be expected within that region. (Figure 5.32)

Very few potential wetland environments are present within the Spring/Steptoe Valley analytic unit and less than 20% of the analytic unit lies within 5000 meters of this evidential theme. Not surprisingly, highest site contrasts within inventoried areas are within the buffered class that lies more than 5000 meters from potential wetlands. When all sites are considered, areas more than 5000 meters from wetlands have a negative contrast, indicating a weak correlation with sites. Since the results of the weights calculations are inconclusive, no classes within potential wetlands were selected as most predictive for analysis.

Weight calculations for slope in all runs identifies gradient between 0 and 5 degrees as having the highest contrast. Likewise, chi-square for slopes between 0 and 5 degrees meets the critical value for non-random distribution. While sampling discrepancy may marginally effect contrast values, the high frequency of sites both within inventoried samples and when all sites are considered suggests that slopes of 0 to 5 degrees are "inside" the predictive pattern. (Figure 5.33)

Figure 5.30 Spring/Steptoe Valley Analytic Unit - Inventories and Prehistoric Sites

Table 5.17
Spring/Steptoe Valley Analytic Unit Inventory Summary

Potential Vegetation

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
2	Great Basin pine	128.1049	0	0.0670	0.05%	0
22	Juniper/pinyon	3555.2065	132	88.0772	2.48%	46
23	Sagebrush	5787.5136	454	244.7825	4.23%	287
25	Desert shrub	4009.4624	214	52.8545	1.32%	72
26	Barren	177.7257	18	0.6978	0.39%	1
28	Missing data	28.1133	1	0.0477	0.17%	0
-99	No data	101.0245	4	0.7529	0.75%	4
	Total	13787.1509	823	387.2796	2.81%	0

Streams and Springs

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	4561.6924	304	129.4365	2.84%	118
400	200-400m	3462.2029	186	92.0749	2.66%	92
1000	400-1000m	4134.0045	206	116.4497	2.82%	125
2000	1000-2000m	987.8584	99	39.9362	4.04%	61
9999	>2000m	633.1852	28	9.3823	1.48%	14
-99	No data	8.2078	0	0.0000	0.00%	0
	Total	13787.1512	823	387.2796	2.81%	410

Potential Wetlands

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1000	0-1000m	729.6486	45	66.3411	9.09%	30
3000	1000-3000m	1008.9361	61	59.9832	5.95%	30
5000	3000-5000m	992.0907	99	51.3404	5.17%	45
9999	>5000m	11048.2698	618	209.6149	1.90%	305
-99	No data	8.2078	0	0.0052	0.06%	0
	Total	13787.1510	823	387.2796	2.81%	410

Landform

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1	Flat	7095.0529	594	273.2000	3.85%	336
2	Piedmont	2778.4120	164	76.9356	2.77%	65
3	Mountain	3908.9211	65	37.2291	0.95%	17
	Total	13782.3860	823	387.3647	2.81%	418

Slope

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
0-5	degrees	8424.7292	677	313.5119	3.72%	369
5-15	degrees	2809.3170	118	52.8038	1.88%	33
15-30	degrees	2141.2830	24	17.4382	0.81%	8
30-45	degrees	390.9139	4	3.4511	0.88%	0
>45	degrees	12.7016	0	0.0745	0.59%	0
-99	No data	8.2063	0	0.0000	0.00%	0
	Total	13787.1510	823.0000	387.2795	2.81%	410

Summary Vegetation

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Great Basin pine	17	7	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Juniper/pinyon	21764	8808	46	0.0021	0.2114	473.1381	0.0052	0.5223	191.4722
Sagebrush	60487	24478	287	0.0047	0.4745	210.7564	0.0117	1.1725	85.2901
Desert shrub	13061	5285	72	0.0055	0.5513	181.3977	0.0136	1.3622	73.4090
Barren	172	70	1	0.0058	0.5799	172.4301	0.0143	1.4331	69.7800
Missing data	12	5	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No data	186.045656	75.29	4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	95699	38728	0	0.0000	0.0042	23924.7201	0.0001	0.0103	9681.9900

Summary Water

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	31964	12944	118	0.0037	0.3689	271.0547	0.0091	0.9116	109.6919
200-400m	22752	9207	92	0.0040	0.4044	247.3066	0.0100	0.9992	100.0814
400-1000m	28775	11645	125	0.0043	0.4344	230.2028	0.0107	1.0734	93.1598
1000-2000m	9868	3994	61	0.0062	0.6181	161.7779	0.0153	1.5274	65.4692
>2000m	2318	938	14	0.0060	0.6039	165.6012	0.0149	1.4922	67.0164
No data	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	95699	38728	410	0.0043	0.4284	233.4119	0.0106	1.0587	94.4584

Summary Wetland

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	16393	6634	30	0.0018	0.1830	546.4415	0.0045	0.4522	221.1370
1000-3000m	14822	5998	30	0.0020	0.2024	494.0724	0.0050	0.5001	199.9440
3000-5000m	12686	5134	45	0.0035	0.3547	281.9220	0.0088	0.8765	114.0898
>5000m	51797	20961	305	0.0059	0.5888	169.8261	0.0146	1.4550	68.7262
No data	1	1	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	95699	38728	410	0.0043	0.4284	233.4119	0.0106	1.0587	94.4584

Summary Landform

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Flat	67509	27320	336	0.0050	0.4977	200.9202	0.0123	1.2299	81.3095
Piedmont	19011	7694	65	0.0034	0.3419	292.4800	0.0084	0.8449	118.3625
Mountain	9200	3723	17	0.0018	0.1848	541.1477	0.0046	0.4566	218.9947
Total	95720	38736	418	0.0044	0.4367	228.9950	0.0108	1.0791	92.6710

Summary Slope

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-5°	77470	31351	369	0.0048	0.4763	209.9471	0.0118	1.1770	84.9626
5-15°	13048	5280	33	0.0025	0.2529	395.3971	0.0062	0.6250	160.0115
15-30°	4309	1744	8	0.0019	0.1857	538.6342	0.0046	0.4588	217.9775
30-45°	853	345	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
>45°	18	7	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No data	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	95699	38728	410	0.0043	0.4284	233.4118	0.0106	1.0587	94.4584

Roads (Historic)						
CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	3527.2332	116	157.8493	4.48%	48
400	200-400m	2477.0025	16	78.4685	3.17%	13
600	400-600m	1822.2019	10	47.8669	2.63%	8
800	600-800m	1363.7650	11	28.4760	2.09%	4
1000	800-1000m	1050.1234	4	19.4840	1.86%	2
9999	>1000m	3546.7283	15	55.1349	1.55%	4
-99	No data	0.0000	0	0.0000	0.00%	0
	Total	13787.0543	172	387.2796	2.81%	79

Water (Historic)						
CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	4561.6924	68	129.4365	2.84%	26
400	200-400m	3462.2029	23	92.0749	2.66%	11
1000	400-1000m	4134.0045	53	116.4497	2.82%	28
9999	>1000m	1621.0435	28	49.3184	3.04%	14
	Total	13778.9433	172	387.2795	2.81%	79

Summary Inventoried Roads (Historic)									
	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	39005	15785	48	0.0012	0.1231	812.6128	0.0030	0.3041	328.8527
200-400m	19390	7847	13	0.0007	0.0670	1491.5377	0.0017	0.1657	603.6038
400-600m	11828	4787	8	0.0007	0.0676	1478.5212	0.0017	0.1671	598.3363
600-800m	7037	2848	4	0.0006	0.0568	1759.1433	0.0014	0.1405	711.9000
800-1000m	4815	1948	2	0.0004	0.0415	2407.3008	0.0010	0.1026	974.2000
>1000m	13624	5513	4	0.0003	0.0294	3406.0329	0.0007	0.0725	1378.3725
No data	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	95699	38728	79	0.0008	0.0826	1211.3782	0.0020	0.2040	490.2273

Summary Water (Historic)									
	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	31984	12944	26	0.0008	0.0813	1230.1715	0.0020	0.2009	497.8327
1000-3000m	22752	9207	11	0.0005	0.0483	2068.3823	0.0012	0.1195	837.0445
3000-5000m	28775	11645	28	0.0010	0.0973	1027.6911	0.0024	0.2404	415.8918
>5000m	12187	4932	14	0.0011	0.1149	870.4888	0.0028	0.2839	352.2743
Total	95699	38728	79	0.0008	0.0826	1211.3779	0.0020	0.2040	490.2272

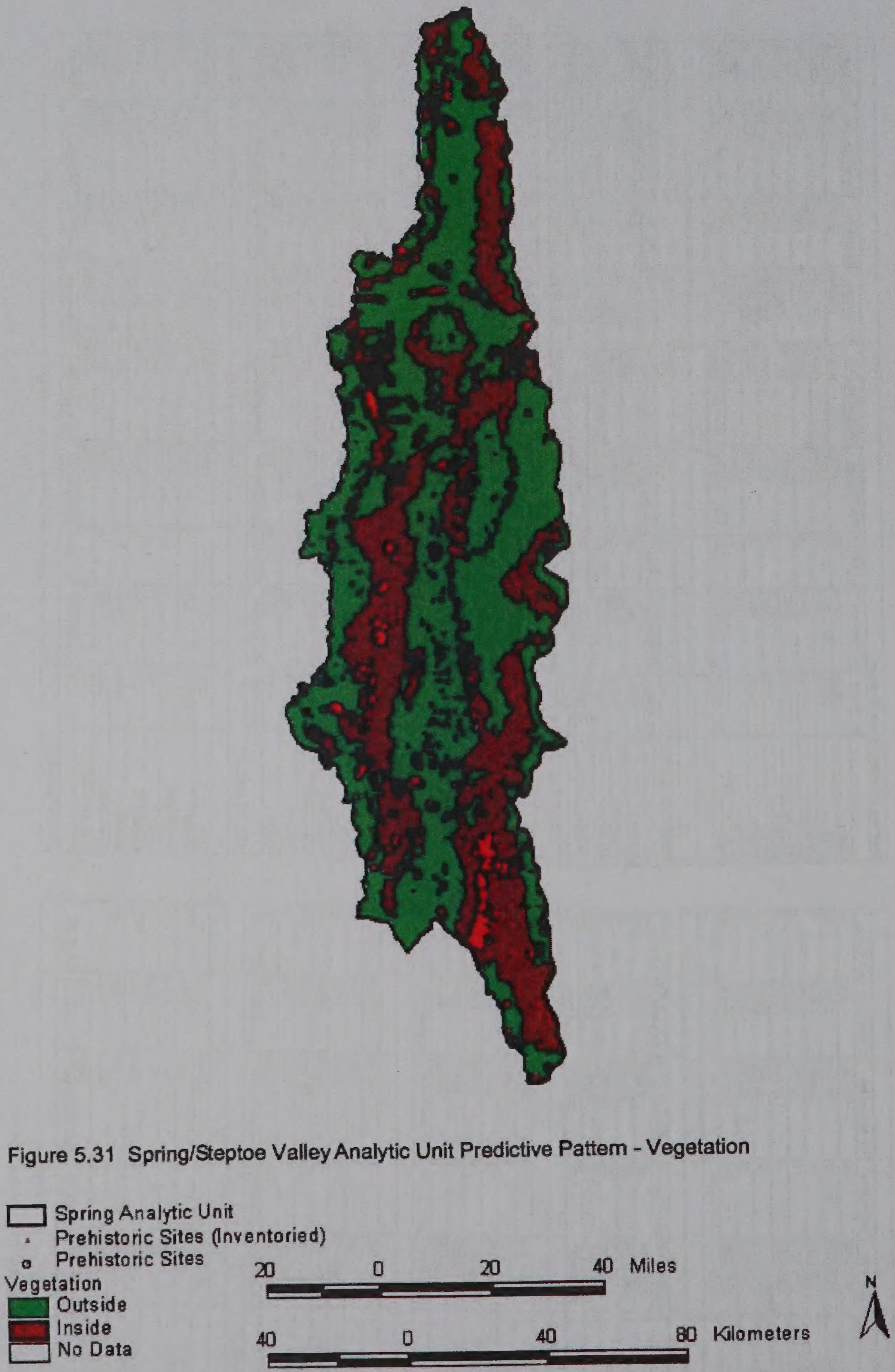


Figure 5.31 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Vegetation

Table 5.18
Spring/Steptoe Valley Analytic Unit Prehistoric Evidential Theme Weights/Chi-Square

Theme Weight

ALL SITES

Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	128	512	0	0					
22	Juniper/pinyon	3555	14221	108	132	-0.4819	0.1267	-0.6085	0.1055	-5.77
25	Sagebrush	5788	23150	382	454	0.3031	-0.2978	0.6009	0.0785	7.65
28	Desert shrub	4009	16038	166	214	-0.1695	0.0626	-0.2322	0.0900	-2.58
62	Barren	178	711	13	18	0.4077	-0.0066	0.4143	0.2827	1.47
9999	Missing data	28	112	1	1	-0.3228	0.0006	-0.3233	1.0052	-0.32
-99	No data	101	404	0	4	0.0000	0.0000	0.0000	0.0000	0.00
	Total	13787		670	823					

Inventoried Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	0	0	0					
22	Juniper/pinyon	88	352	38	46	-0.7656	0.1691	-0.9346	0.1846	-5.06
25	Sagebrush	245	979	234	287	0.1890	-0.3880	0.5770	0.1395	4.14
28	Desert shrub	53	211	46	72	0.0674	-0.0109	0.0783	0.1800	0.44
62	Barren	1	3	1	1	0.7643	-0.0017	0.7660	1.2499	0.61
9999	Missing data	0	0	0	0					
-99	No data	1	3		4					
	Total	387		319	410					

Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	1	0	0					
22	Juniper/pinyon	88	1409	155	46	-0.2867	0.0743	-0.3610	0.0943	-3.83
25	Sagebrush	245	3917	604	287	0.1023	-0.1968	0.2992	0.0785	3.81
28	Desert shrub	53	845	112	72	-0.0742	0.0114	-0.0855	0.1087	-0.79
62	Barren	1	11	2	1	0.2814	-0.0006	0.2820	0.7813	0.36
9999	Missing data	0	1	1	0		-0.0012			
-99	No data	1	3		4					
	Total	387		874	410					

Non Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	1	0	0					
22	Juniper/pinyon	88	1409	1252	46	0.6199	-0.1430	0.7629	0.0917	8.32
25	Sagebrush	245	3917	3133	287	-0.0689	0.1265	-0.1954	0.0686	-2.85
28	Desert shrub	53	846	624	72	-0.4199	0.0771	-0.4970	0.0860	-5.78
62	Barren	1	11	5	1	-1.6643	0.0043	-1.6686	0.6027	-2.77
9999	Missing data	0	1	0	0					
-99	No data	1	3		4					
	Total	387		5014	410					

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	4562	18247	253	304	0.1303	-0.0712	0.2014	0.0801	2.51
400	200-400m	3462	13849	157	186	-0.0736	0.0236	-0.0972	0.0917	-1.06
1000	400-1000m	4134	16536	164	206	-0.2088	0.0779	-0.2867	0.0903	-3.18
2000	1000-2000m	988	3951	77	99	0.4763	-0.0479	0.5242	0.1223	4.29
9999	>2000m	633	2533	21	28	-0.3895	0.0155	-0.4050	0.2226	-1.82
-99	No data	8	33		0					
	Total	13787		672	823					

Inventories Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	518	92	118	-0.1903	0.0879	-0.2782	0.1372	-2.03
400	200-400m	92	368	75	92	-0.0219	0.0068	-0.0287	0.1479	-0.19
1000	400-1000m	116	466	98	125	0.0182	-0.0083	0.0276	0.1363	0.20
2000	1000-2000m	40	160	45	61	0.4058	-0.0530	0.4587	0.1883	2.44
9999	>2000m	9	38	11	14	0.4615	-0.0130	0.4745	0.3642	1.30
	Total	387		321	410					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	2072	284	118	-0.0371	0.0183	-0.0554	0.0778	-0.71
400	200-400m	92	1473	178	92	-0.1823	0.0523	-0.2346	0.0898	-2.61
1000	400-1000m	116	1863	281	125	0.0744	-0.0333	0.1077	0.0783	1.37
2000	1000-2000m	40	638	117	61	0.3087	-0.0401	0.3488	0.1095	3.19
9999	>2000m	9	150	17	14	-0.2633	0.0057	-0.2590	0.2602	-1.00
	Total	387		877	410					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	2072	1701	118	0.0182	-0.0090	0.0272	0.0701	0.39
400	200-400m	92	1473	1223	92	0.0800	-0.0241	0.1041	0.0788	1.32
1000	400-1000m	116	1863	1541	125	0.0598	-0.0250	0.0848	0.0727	1.17
2000	1000-2000m	40	636	482	61	-0.3784	0.0495	-0.4279	0.0986	-4.34
9999	>2000m	9	150	124	14	0.0631	-0.0015	0.0647	0.2188	0.30
	Total	387		5071	410					

Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	730	2919	37	45	0.0395	-0.0023	0.0417	0.1702	0.25
3000	1000-3000m	1009	4036	53	61	0.0752	-0.0062	0.0814	0.1441	0.57
5000	3000-5000m	992	3968	74	99	0.4314	-0.0425	0.4739	0.1243	3.81
9999	>5000m	11048	44193	508	618	-0.0596	0.2111	-0.2707	0.0905	-2.99
-99	Missing data	8	33		0					
	Total	13787		672	823					

Inventoried Wetland

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	66	265	23	30	-1.0131	0.1455	-1.1586	0.2280	-5.08
3000	1000-3000m	60	240	27	30	-0.7233	0.1026	-0.8259	0.2148	-3.85
5000	3000-5000m	51	205	35	45	-0.2408	0.0339	-0.2747	0.1972	-1.39
9999	>5000m	210	838	236	305	0.4046	-0.6544	1.0590	0.1388	7.63
	Total	387		321	410					

Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000	66	1062	76	30	-0.7603	0.1144	-0.8746	0.1251	-6.99
3000	1000-3000	60	960	80	30	-0.5953	0.0852	-0.6805	0.1229	-5.53
5000	3000-5000	51	822	110	45	-0.0645	0.0096	-0.0741	0.1096	-0.68
9999	>5000m	210	3353	611	305	0.3013	-0.4685	0.7699	0.0784	9.82
	Total	387		877	410					

Non Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000	66	1062	940	30	0.5369	-0.0903	0.6272	0.1025	6.12
3000	1000-3000	60	960	855	30	0.5917	-0.0867	0.6784	0.1091	6.22
5000	3000-5000	51	822	688	45	0.1333	-0.0194	0.1527	0.1009	1.51
9999	>5000m	210	3353	2588	305	-0.2864	0.4241	-0.7105	0.0698	-10.18
	Total	387		5071	410					

Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	8425	33699	559	677	0.3123	-0.8446	1.1569	0.1035	11.18
5-15	degrees	2809	11237	87	118	-0.4586	0.0905	-0.5492	0.1154	-4.76
15-30	degrees	2141	8565	22	24	-1.5672	0.1374	-1.7046	0.2171	-7.85
30-45	degrees	391	1564	4	4	-1.5713	0.0231	-1.5944	0.5022	-3.18
>45	degrees	13	51	0	0					
-99	Missing data	8	33		0					
	Total	13787		672	823					

Inventoried Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	314	1254	292	369	0.1495	-0.8747	1.0242	0.2057	4.98
5-15	degrees	53	211	23	33	-0.7603	0.0920	-0.8523	0.2305	-3.70
15-30	degrees	17	70	6	8	-1.0215	0.0344	-1.0559	0.4317	-2.45
30-45	degrees	3	14	0	0					
>45	degrees	0	0	0	0					
	Total	387		321	410					

Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	313	5016	742	369	0.0516	-0.2442	0.2958	0.0997	2.97
5-15	degrees	53	845	117	33	-0.0252	0.0039	-0.0291	0.1070	-0.27
15-30	degrees	17	279	15	8	-1.0657	0.0337	-1.0993	0.2680	-4.10
30-45	degrees	3	55	3	0	-1.0548	0.0064	-1.0612	0.5948	-1.78
>45	degrees	0	1	0	0					
	Total	387		877	410					

Non Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	313	5016	4033	369	-0.0939	0.4818	-0.5757	0.0962	-5.98
5-15	degrees	53	845	737	33	0.4173	-0.0564	0.4737	0.1089	4.35
15-30	degrees	17	279	245	8	0.4668	-0.0188	0.4856	0.1859	2.61
30-45	degrees	3	55	54	0	2.2651	-0.0096	2.2747	0.9075	2.51
>45	degrees	0	1	2	0		-0.0011			
	Total	387		5071	410					

Landform										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	7095	28380	494	594	0.3618	-0.6109	0.9725	0.0878	11.07
2	Piedmont	2778	11114	124	164	-0.0895	0.0214	-0.1109	0.1000	-1.11
2	Mountain	3909	15636	54	65	-1.2699	0.2533	-1.5232	0.1422	-10.71
	Total	13782		672	823					
Inventoried Landform										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	273	1093	270	336	0.2005	-0.6129	0.8134	0.1571	5.18
2	Piedmont	77	308	46	65	-0.4239	0.0901	-0.5140	0.1736	-2.96
2	Mountain	37	149	12	17	-1.1197	0.0816	-1.2013	0.3078	-3.90
	Total	387		328	418					
Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	273	4371	667	336	0.0831	-0.2221	0.3052	0.0840	3.63
2	Piedmont	77	1231	157	65	-0.1253	0.0294	-0.1547	0.0944	-1.64
2	Mountain	37	596	57	17	-0.4485	0.0399	-0.4884	0.1443	-3.38
	Total	387		881	418					
Non Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	273	4371	3523	336	-0.1175	0.3252	-0.4427	0.0786	-5.63
2	Piedmont	77	1231	1064	65	0.3105	-0.0679	0.3785	0.0909	4.17
2	Mountain	37	596	518	17	0.3561	-0.0333	0.3894	0.1265	3.08
	Total	387		5105	418					

Chi-square

Spring Vegetation			
Points on 250m grid			
	Site	Not Site	ROW
Sagebrush	604	3133	3737
Other veg	270	1881	2151
COL	874	5014	5888
Expected values			
	Site	Not Site	
Sagebrush	554.71	3182.29	
Other veg	319.29	1831.71	
Cell chi values			
	Site	Not Site	
Sagebrush	49.29	-49.29	
Other veg	-49.29	49.29	
Chi-squares			
	Site	Not Site	
Sagebrush	4.38	0.78	
Other veg	7.61	1.33	
14.08	Chi Square		
Cell std. residuals			
	Site	Not Site	
Sagebrush	2.09	-0.87	
Other veg	-2.76	1.15	
Cell variance			
	Site	Not Site	
Sagebrush	0.31	0.05	
Other veg	0.54	0.09	
Adj. std. residuals			
	Site	Not Site	
Sagebrush	3.75	-3.75	
Other veg	-3.75	3.75	
			0.00

Spring Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
1000-2000	117	482	599
0-1000,>2000	760	4589	5349
COL	877	5071	5948
Expected values			
	Site	Not Site	
1000-2000	88.32	510.68	
0-1000,>2000	788.68	4560.32	
Cell chi values			
	Site	Not Site	
1000-2000	28.68	-28.68	
0-1000,>2000	-28.68	28.68	
Chi-squares			
	Site	Not Site	
1000-2000	9.31	1.61	
0-1000,>2000	1.04	0.18	
12.15	Chi Square		
Cell std. residuals			
	Site	Not Site	
1000-2000	3.05	-1.27	
0-1000,>2000	-1.02	0.42	
Cell variance			
	Site	Not Site	
1000-2000	0.31	0.05	
0-1000,>2000	0.54	0.09	
Adj. std. residuals			
	Site	Not Site	
1000-2000	5.47	-5.64	
0-1000,>2000	-1.39	1.43	
			-0.12

Spring Wetland			
Points on 250m grid			
	Site	Not Site	ROW
>5000	611	2588	3199
<5000	266	2483	2749
COL	877	5071	5948
Expected values			
	Site	Not Site	
>5000	471.68	2727.32	
<5000	405.32	2343.68	
Cell chi values			
	Site	Not Site	
>5000	139.32	-139.32	
<5000	-139.32	139.32	
Chi-squares			
	Site	Not Site	
>5000	41.15	7.12	
<5000	47.89	8.28	
104.45	Chi Square		
Cell std. residuals			
	Site	Not Site	
>5000	6.42	-2.67	
<5000	-6.92	2.88	
Cell variance			
	Site	Not Site	
>5000	0.31	0.05	
<5000	0.54	0.09	
Adj. std. residuals			
	Site	Not Site	
>5000	11.51	-11.85	
<5000	-9.42	9.70	
			-0.06

Spring Slope			
Points on 250m grid			
	Site	Not Site	ROW
0-5 degree	742	4033	4775
>5 degree	135	1038	1173
COL	877	5071	5948
Expected values			
	Site	Not Site	
0-5 degree	704.05	4070.95	
>5 degree	172.95	1000.05	
Cell chi values			
	Site	Not Site	
0-5 degree	37.95	-37.95	
>5 degree	-37.95	37.95	
Chi-squares			
	Site	Not Site	
0-5 degree	2.05	0.35	
>5 degree	8.33	1.44	
12.17	Chi Square		
Cell std. residuals			
	Site	Not Site	
0-5 degree	1.43	-0.59	
>5 degree	-2.89	1.20	
Cell variance			
	Site	Not Site	
0-5 degree	0.31	0.05	
>5 degree	0.54	0.09	
Adj. std. residuals			
	Site	Not Site	
0-5 degree	2.57	-2.64	
>5 degree	-3.93	4.04	
			0.04

Spring Landform			
Points on 250m grid			
	Site	Not Site	ROW
Flat	667	3523	4190
Not Flat	214	1582	1796
COL	881	5105	5986
Expected values			
	Site	Not Site	
Flat	616.67	3573.33	
Not Flat	264.33	1531.67	
Cell chi values			
	Site	Not Site	
Flat	50.33	-50.33	
Not Flat	-50.33	50.33	
Chi-squares			
	Site	Not Site	
Flat	4.11	0.71	
Not Flat	9.58	1.65	
16.06	Chi Square		
Cell std. residuals			
	Site	Not Site	
Flat	2.03	-0.84	
Not Flat	-3.10	1.29	
Cell variance			
	Site	Not Site	
Flat	0.31	0.05	
Not Flat	0.54	0.08	
Adj. std. residuals			
	Site	Not Site	
Flat	3.64	-3.82	
Not Flat	-4.21	4.43	
			0.03

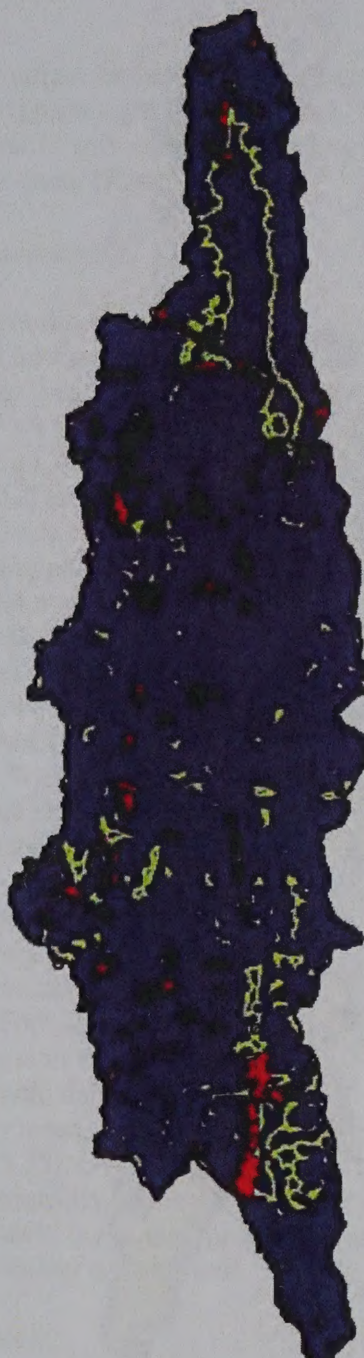
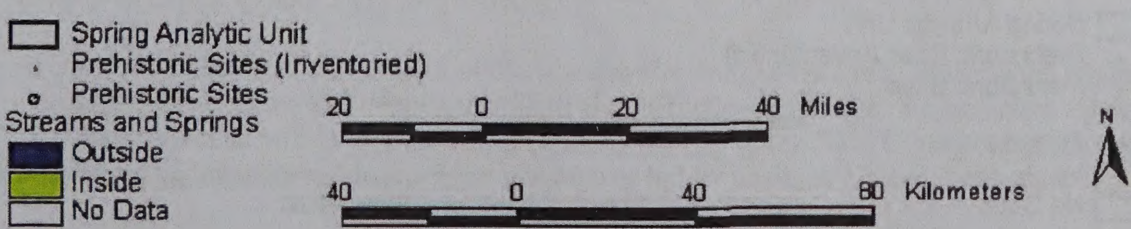


Figure 5.32 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Streams and Springs



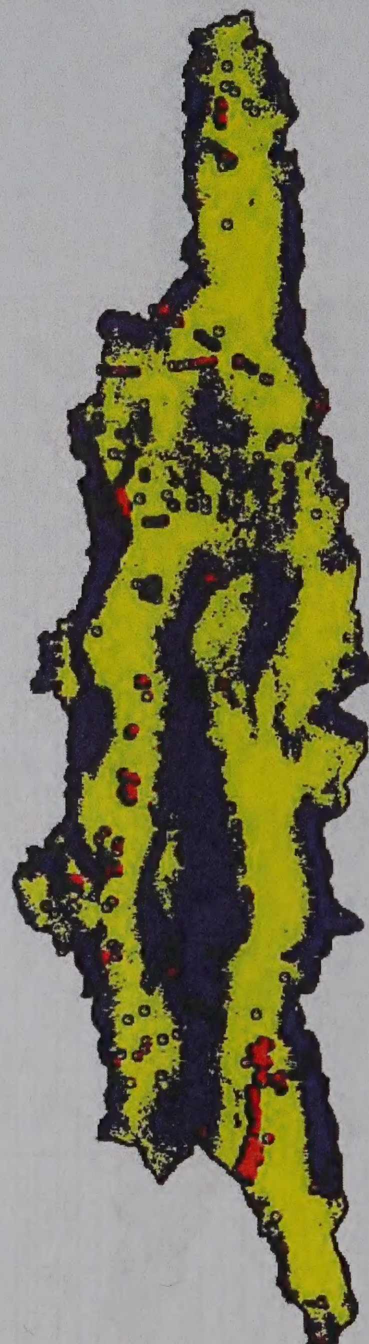
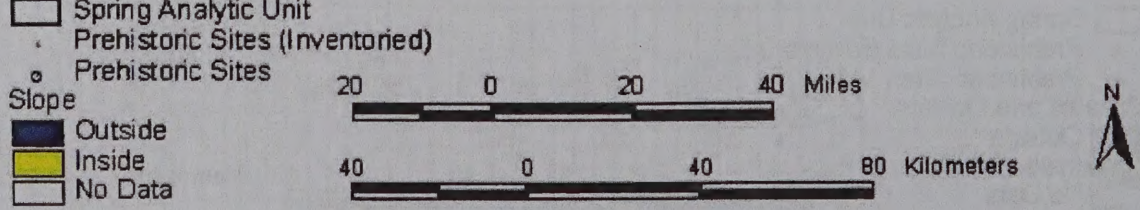


Figure 5.33 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Slope



Flats exhibit the highest contrast for landforms in all analytical runs. Frequency of sites is highest in this class and suggests a greater than normal distribution of sites. In contrast, the negative contrast for piedmont with adequate sampling suggests that fewer sites than expected occur within that class. (Figure 5.34)

Prehistoric Predictive Response

Normalized posterior probabilities were used as a means to evaluate tabular results from the response theme generated for the Spring/Steptoe Valley analytic Unit. (Figure 5.35) Prior probability for the response theme was set at 0.0122 and observed breaks within normalized posterior probability were set at 0.016 and 0.0095. (Table 5.19) (Figure 5.36) Highest probabilities for encountering sites occur as evidential classes identified as inside the predictive pattern intersect. Three or more combinations of flats and 0 to 5 degree slope, with sagebrush or 1000 to 2000 meters from water have the highest probability scores and the highest frequency of training points. As intersecting conditions decrease, probability becomes moderate and where only a single evidential condition is met, probabilities fall below the prior value of 0.012 and are low. Analysis of the response themes show that by area, the highest proportion of sites fall within high and medium probability zones. (Table 5.20) High probability zones have been more intensively surveyed than zones of medium or low probability and the lowest proportion of inventoried site by area occurs within the medium probability zone. When high and medium probability zones are combined, however, over 80% of the inventoried site area falls within that area. About 66% of all site areas fall within the high and moderate probability zones.

When probabilities are recalculated by composite predictive class, the extent of high and medium probability areas are increased and of low probability area is decreased. (Table 5.20) Twenty-nine percent of the analytic unit lies within the high probability zone and 49% of all sites fall within that area. Forty-four percent of the analytic unit is classified as medium probability and 44% of the sites occur there, while 19% of all site areas fall within the remaining 27% of the analytic unit. Within inventoried site areas, almost 73% of the sites fall within high probability areas, 19% in medium probability zones and 8% in the low probability zone. (Figure 5.37) Over 56% of the inventories have been conducted within areas identified as high probability and most of the site area lies within that zone. Correlations between site density and high probability areas may be biased by sampling within the Spring/Steptoe Valley analytic unit

Historic Evidential Themes

One hundred forty-four historic sites are included in the analysis of the Spring/Steptoe Valley analytic unit. Seventy-nine of these have been identified within inventories greater than 640 acres in extent. (Table 5.17) (Figure 5.38)

Contrasts within buffered classes of roads and water sources are easily discernable. Highest contrasts are evident within 200 meters of existing roads, and weights for non-sites exhibit a negative contrast within the same buffer. (Table 5.21) (Figure 5.39) Other contrasts for buffered distances to roads are either negative or lightly positive. Highest contrast and

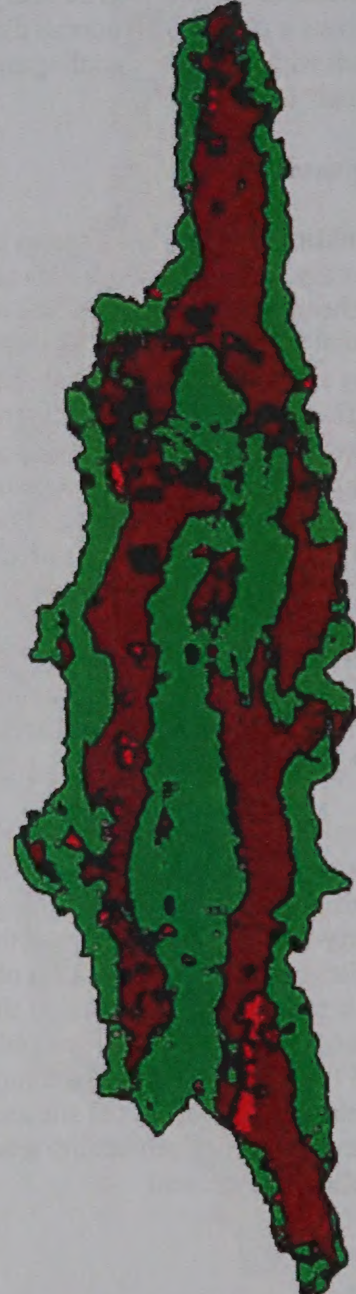


Figure 5.34 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Landform

Spring Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Landform
Outside
Inside
No Data

20 0 20 40 Miles
40 0 40 80 Kilometers
N

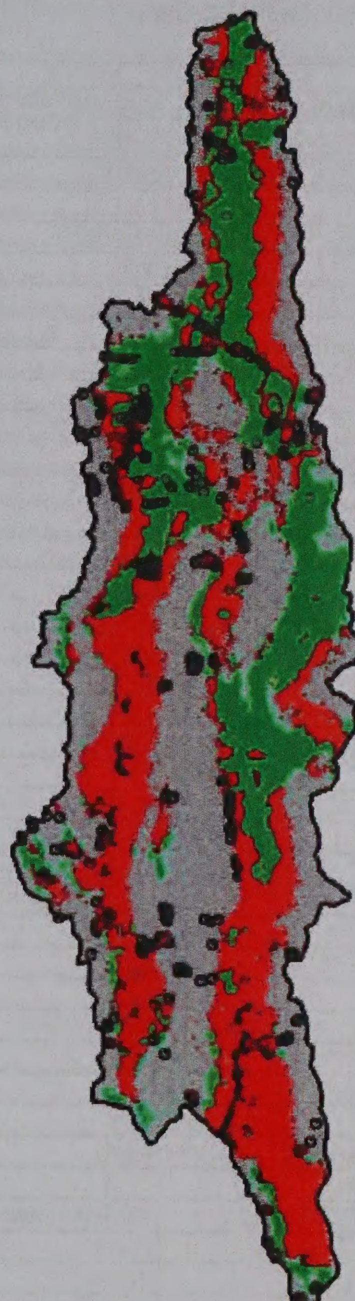


Figure 5.35 Spring/Steptoe Valley Analytic Unit Observed Probability - Prehistoric

Spring Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Probability
Low
Medium
High
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Table 5.19
Spring/Steptoe Valley Analytic Unit Prehistoric Response

VALUE	LANDFORM	WATER	VEGETATION	SLOPE	AREA sq.m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
31	1	1	1	1	355435824.42	49	0.05059570	0.04114041	High
15	1	1	-99	1	1229572.51	0	0.03786716	0.03079057	
5	1	0	1	1	3334970037.75	284	0.03058544	0.02486966	
17	1	1	0	1	300175812.20	20	0.02839136	0.02308560	
22	1	-99	1	-99	81177.11	0	0.02364746	0.01922824	
3	1	0	-99	1	8829686.05	0	0.02277022	0.01851494	
26	0	1	1	1	24821576.11	0	0.01902360	0.01546848	Med
25	1	-99	-99	-99	568984.49	0	0.01757290	0.01428889	
9	1	0	0	1	3038415916.11	144	0.01700548	0.01382751	
32	1	1	1	0	501212.78	0	0.01648198	0.01340184	
13	0	1	-99	1	1166269.26	0	0.01411964	0.01148097	
20	1	-99	0	-99	571218.72	0	0.01310631	0.01065701	
18	1	1	-99	0	42450.41	0	0.01222504	0.00994043	
7	0	0	1	1	653998520.90	17	0.01135061	0.00922942	Low
16	0	1	0	1	23964375.65	4	0.01052139	0.00855516	
6	1	0	1	0	30269379.20	1	0.00982387	0.00798799	
30	1	1	0	0	817729.02	0	0.00910515	0.00740359	
23	0	-99	1	-99	641224.67	0	0.00873652	0.00710385	
1	0	0	-99	1	9113433.55	2	0.00840767	0.00683645	
4	1	0	-99	0	294918.66	0	0.00727386	0.00591453	
29	0	-99	0	1	744.74	0	0.00656075	0.00533468	
24	0	-99	-99	-99	3668609.44	0	0.00646691	0.00525838	
10	0	0	0	1	672607441.73	39	0.00625582	0.00508674	
27	0	1	1	0	60981136.40	2	0.00606120	0.00492849	
12	1	0	0	0	26810787.60	1	0.00541061	0.00439948	
21	0	-99	0	-99	2675120.81	0	0.00480937	0.00391060	
14	0	1	-99	0	12254019.42	0	0.00448345	0.00364559	
8	0	0	1	0	1325813554.91	29	0.00359730	0.00292504	
19	0	1	0	0	206468385.82	2	0.00333259	0.00270980	
28	0	-99	-99	0	744.74	0	0.00278931	0.00226805	
2	0	0	-99	0	63855848.62	0	0.00265920	0.00216225	
11	0	0	0	0	3626105401.32	78	0.00197567	0.00160646	
						Prior Probability	0.01200000		

Table 5.20
Spring/Steptoe Analytic Unit Model Summary Prehistoric Response

	High	Medium	Low	Total
Model area (m^2)	4000722110.04	3066087627.88	6720341377.20	13787151115.12
Model area (km^2)	4000.72	3066.09	6720.34	13787.15
% Model area	29.02%	22.24%	48.74%	100.00%
All sites area (m^2)	19810194.00	5458229.50	15062449.00	40330872.50
All sites area (km^2)	19.81	5.46	15.06	40.33
% Site area	49.12%	13.53%	37.35%	100.00%
All site area / model area	**0.0050**	**0.0018**	**0.0022**	**0.0029**
Inventory area (m^2)	218014896.00	54157048.00	115107648.00	387279592.00
Inventory area (km^2)	218.01	54.16	115.11	387.28
% Inventory area	56.29%	13.98%	29.72%	100.00%
% Model area inventoried	**5.45%**	**1.77%**	**1.71%**	**2.81%**
Inventory sites area (m^2)	11772915.00	1365860.63	3094411.75	16233187.38
Inventory sites area (km^2)	11.77	1.37	3.09	16.23
% Inventory site area	72.52%	8.41%	19.06%	100.00%
Inv site area / inv area	**0.0540**	**0.0252**	**0.0269**	**0.0419**

Spring/Steptoe Analytic Unit Model Summary Prehistoric Composite

	High (4-3)	Medium (2-1)	Low (0)	Total
Model area (m^2)	4015904512.0000	6040147456.0000	3626105344.0000	13682157312.00
Model area (km^2)	4015.90	6040.15	3626.11	13682.16
% Model area	29.35%	44.15%	26.50%	100.00%
All sites area (m^2)	19854878.0000	12672566.0000	7725230.5000	40252674.50
All sites area (km^2)	19.85	12.67	7.73	40.25
% site area	49.33%	31.48%	19.19%	100.00%
All site area / model area	**0.0049**	**0.0021**	**0.0021**	**0.0029**
Inventory area (m^2)	218768576.0000	113754448.0000	54003628.0000	386526652.00
Inventory area (km^2)	218.77	113.75	54.00	386.53
% Inventory area	56.60%	29.43%	13.97%	100.00%
% Model area inventoried	**5.45%**	**1.88%**	**1.49%**	**2.83%**
Inventory sites area (m^2)	11772915.0000	3118988.2500	1298089.0000	16189992.25
Inventory sites area (km^2)	11.77	3.12	1.30	16.19
% Inventory site area	72.72%	19.26%	8.02%	100.00%
Inv site area / inv area	**0.0538**	**0.0274**	**0.0240**	**0.0419**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

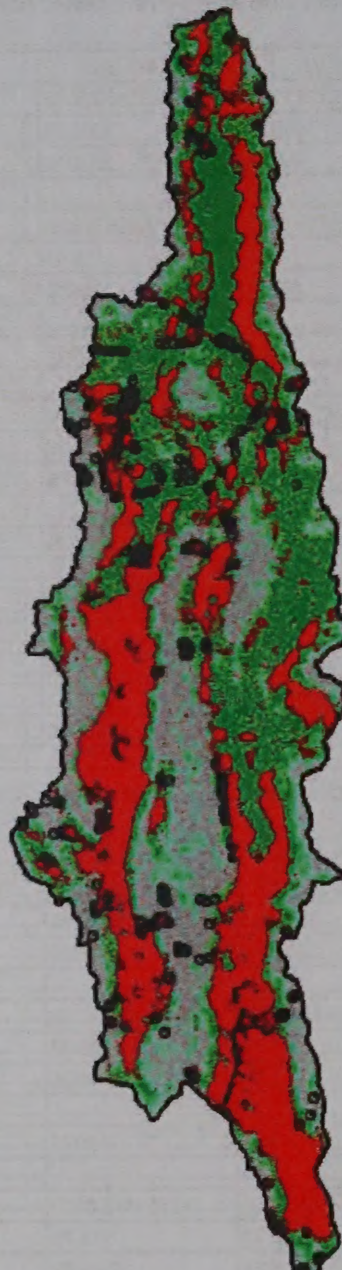


Figure 5.37 Spring/Steptoe Valley Analytic Unit Composite Probability - Prehistoric

Spring Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Probability
Low
Medium
High
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Figure 5.38 Spring/Steptoe Valley Analytic Unit - Inventories and Historic Sites

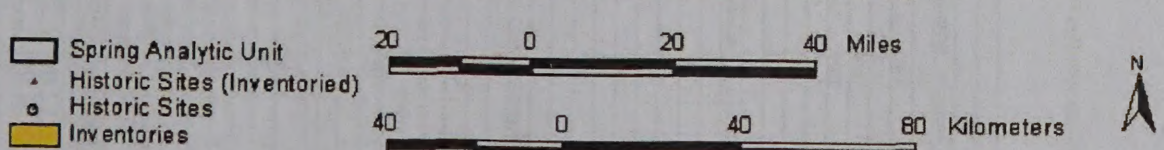


Table 5.21
Spring/Steptoe Valley Analytic Unit Historic Evidential Theme Weights/Chi Square

Theme Weight

ALL SITES										
Roads										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	3527	14109	97	116	0.9724	-0.8256	1.7980	0.1780	10.10
400	200-400m	2477	9908	14	16	-0.6153	0.0960	-0.7113	0.2815	-2.53
600	400-600m	1822	7289	8	10	-0.8682	0.0848	-0.9530	0.3640	-2.62
800	600-800m	1364	5455	11	11	-0.2590	0.0248	-0.2838	0.3141	-0.90
1000	800-1000m	1050	4200	3	4	-1.2983	0.0583	-1.3566	0.5837	-2.32
9999	>1000m	3547	14187	11	15	-1.2161	0.2186	-1.4346	0.3139	-4.57
	Total	13787		144	172					
Inventoried Roads										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	158	631	44	48	0.4592	-0.4844	0.9435	0.2530	3.73
400	200-400m	78	314	11	13	-0.2647	0.0582	-0.3229	0.3347	-0.96
600	400-600m	48	191	6	8	-0.3804	0.0444	-0.4248	0.4341	-0.98
800	600-800m	28	114	4	4	-0.2626	0.0184	-0.2810	0.5244	-0.54
1000	800-1000m	19	78	1	2	-1.2923	0.0390	-1.3313	1.0140	-1.31
9999	>1000m	55	221	4	4	-0.9408	0.0994	-1.0402	0.5202	-2.00
	Total	387		70	79					
[illegible]e 250 Grid Roads										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	158	2526	403	48	0.1465	-0.1105	0.2570	0.0734	3.50
400	200-400m	78	1255	161	13	-0.1087	0.0263	-0.1350	0.0936	-1.44
600	400-600m	48	766	95	8	-0.1468	0.0195	-0.1662	0.1163	-1.43
800	600-800m	28	456	65	4	0.0146	-0.0012	0.0158	0.1392	0.11
1000	800-1000m	19	312	43	2	-0.0246	0.0013	-0.0259	0.1685	-0.15
9999	>1000m	55	882	106	4	-0.1830	0.0281	-0.2111	0.1107	-1.91
	Total	387		873	79					
Non Site 250 Grid Roads										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	158	2526	2289	48	-0.3480	0.3192	-0.6672	0.1018	-6.56
400	200-400m	78	1255	1201	13	0.4753	-0.0947	0.5699	0.1487	3.83
600	400-600m	48	766	706	8	-0.1501	0.0228	-0.1729	0.1452	-1.19
800	600-800m	28	456	444	4	1.0259	-0.0521	1.0779	0.3016	3.57
1000	800-1000m	19	312	289	2	-0.0754	0.0041	-0.0795	0.2239	-0.36
9999	>1000m	55	882	846	4	0.5351	-0.0687	0.6038	0.1779	3.39
	Total	387		5775	79					
Streams and Springs										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	4562	18247	52	68	0.0871	-0.0461	0.1332	0.1737	0.77
400	200-400m	3462	13849	23	23	-0.4540	0.1157	-0.5697	0.2277	-2.50
1000	400-1000m	4134	16536	44	53	0.0183	-0.0080	0.0263	0.1811	0.15
9999	>1000m	1621	6484	25	28	0.3904	-0.0657	0.4561	0.2204	2.07
	Total	13779		144	172					

Chi-square

Spring Roads			
Points on 250m grid			
	Site	Not Site	ROW
0-200	403	2289	2692.00
>200	470	3486	3956.00
COL	873.00	5775.00	6648.00
Expected values			
	Site	Not Site	
0-200	353.51	2338.49	
>200	519.49	3436.51	
Cell chi values			
	Site	Not Site	
0-200	49.49	-49.49	
>200	-49.49	49.49	
Chi-squares			
	Site	Not Site	
0-200	6.93	1.05	
>200	4.72	0.71	
13.40	Chi Square		
Cell std. residuals			
	Site	Not Site	
0-200	2.63	-1.02	
>200	-2.17	0.84	
Cell variance			
	Site	Not Site	
0-200	0.52	0.08	
>200	0.35	0.05	
Adj. std. residuals			
	Site	Not Site	
0-200	3.66	-3.66	
>200	-3.66	3.66	
			0.00

Spring Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
>1000	279	705	984.00
<1000	594	5070	5664.00
COL	873.00	5775.00	6648.00
Expected values			
	Site	Not Site	
>1000	129.22	854.78	
<1000	743.78	4920.22	
Cell chi values			
	Site	Not Site	
>1000	149.78	-149.78	
<1000	-149.78	149.78	
Chi-squares			
	Site	Not Site	
>1000	173.62	26.25	
<1000	30.16	4.56	
234.59	Chi Square		
Cell std. residuals			
	Site	Not Site	
>1000	13.18	-5.12	
<1000	-5.49	2.14	
Cell variance			
	Site	Not Site	
>1000	0.52	0.08	
<1000	0.35	0.05	
Adj. std. residuals			
	Site	Not Site	
>1000	18.33	-18.33	
<1000	-9.26	9.26	
			0.00

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	518	24	26	0.0267	-0.0137	0.0404	0.2578	0.16
400	200-400m	92	368	11	11	-0.4300	0.1055	-0.5355	0.3340	-1.60
1000	400-1000m	116	466	24	28	0.1379	-0.0650	0.2030	0.2581	0.79
9999	>1000m	49	197	11	14	0.2214	-0.0364	0.2577	0.3376	0.76
	Total	387		70	79					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	2071	279	26	-0.0519	0.0254	-0.0773	0.0782	-0.99
400	200-400m	92	1473	181	11	-0.1577	0.0457	-0.2034	0.0894	-2.27
1000	400-1000m	116	1863	281	28	0.0797	-0.0357	0.1155	0.0784	1.47
9999	>1000m	49	789	132	14	0.2029	-0.0322	0.2351	0.1033	2.28
	Total	387		873	79					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	129	2071	1950	26	0.1624	-0.0736	0.2360	0.1112	2.12
400	200-400m	92	1473	1355	11	-0.1784	0.0617	-0.2401	0.1128	-2.13
1000	400-1000m	116	1863	1765	28	0.2714	-0.0995	0.3709	0.1187	3.12
9999	>1000m	49	789	705	14	-0.4913	0.0924	-0.5836	0.1283	-4.55
	Total	387		5775	79					

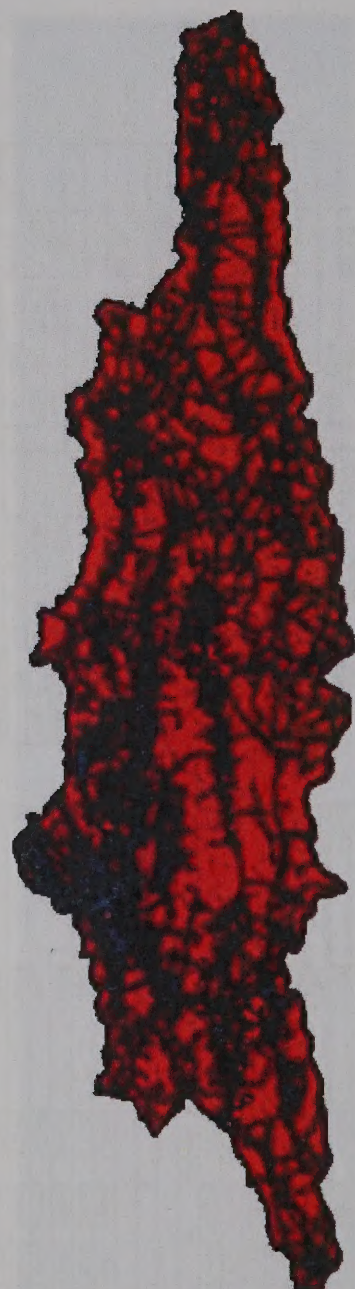
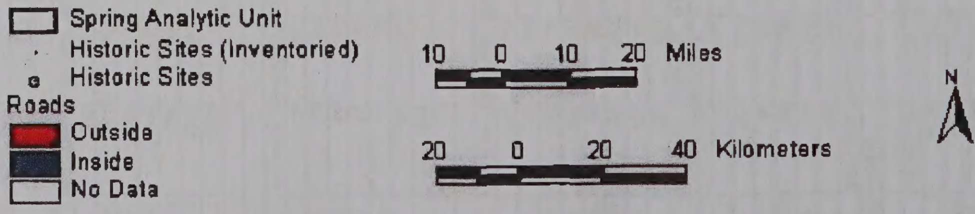


Figure 5.39 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Roads



corresponding chi-square value for water is for the buffered area greater than 1000 meters from water. (Figure 5.40) Areas within 200 meters of roads and more than 1000 meters from water were selected as most predictive for the Spring/Steptoe Valley historic response theme.

Historic Predictive Response

Three apparent breaks are evident in the normalized posterior response for Spring/Steptoe Valley analytic unit historic themes. Breaks lie at 0.006 and 0.0025, with prior probabilities set at 0.0026. (Table 5.22) (Figure 5.41) Highest probabilities occur within 200 meters of roads, or where proximity to roads and distance to water is greater than 1000 meters intersect. No training points fall within a very small zone defined as medium probability. The resulting probability map reflects high and low probabilities. (Figure 5.42) The summary table (Table 5.23) indicates that 26% of the analytic unit is characterized by high probability and 78% of all sites fall within that area. Conversely, the low probability zone covers 75% of the area and contains less than 22% of the site area.

Reclassification of the response theme creates a medium probability zone for the analytic unit. It consists of the area defined by the area within 200 meters of roads, or any area more than 1000 meters from streams and springs. (Figure 5.43) Forty-three percent of the analytic unit falls within the medium probability zone and 66% of all sites lie within that area. (Table 5.23) The extent of low probability area decreases to 51% of the analytic unit and contains 16% of the all historic sites, while 6% of the area and 19% of the sites fall within the high probability zone. Distribution of inventoried sites is slightly higher in high and low probability zones but 80% of the sites still fall within combined high and moderate probability areas.

GREAT SALT LAKE ANALYTIC UNIT

Analytic Unit Description

The Great Salt Lake sub-region covers approximately 10.2 million acres (16,079 mi^2)/ 4,164,611 hectares (41,646 km^2) within southern Idaho, extreme eastern Nevada, and north central Utah. (Figure 5.44) Six hydrographic basins comprise the Great Salt Lake sub-region within the study area. The majority of hydrographic units contain lakebed deposits derived from the relatively recent Lake Gilbert high stand (10,500 B.P.) and current Great Salt Lake shorelines. Slightly more than 10 meters separate the modern and prehistoric shoreline. That area comprises 18% of the sub-region. (Figure 5.45) Periodic fluctuations of the Great Salt Lake create changing environments along lake shorelines. At elevations between 1290 and 1310 meters shorelines encroach upon steeper alluvial slopes of surrounding mountain ranges, effectively eliminating potential river fed marsh areas (Madsen 1982:208). Six hydrographic sub-regions fall within the Great Salt Lake analytic unit. (Table 5.24)

Figure 5.40 Spring/Steptoe Valley Analytic Unit Predictive Pattern - Water

Table 5.22
Spring/Steptoe Valley Analytic Unit Historic Response

VALUE	HISTORIC WATER	ROADS	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
5	1	1	859979844.08	29	0.00700112	0.00700706	High
9	-99	1	1361392.21	0	0.00687504	0.00688088	
4	0	1	2665887469.85	68	0.00682063	0.00682642	
6	1	-99	52876.83	0	0.00265922	0.00266148	Medium
8	-99	-99	8192.19	0	0.00261113	0.00261335	
2	0	-99	52876.83	0	0.00259038	0.00259258	
3	1	0	3273971772.24	15	0.00116641	0.00116740	Low
7	-99	0	6838240.33	0	0.00114528	0.00114625	
1	0	0	6978998450.59	32	0.00113617	0.00113713	

Figure 5.41 Spring/Steptoe Valley Analytic Unit Historic Response

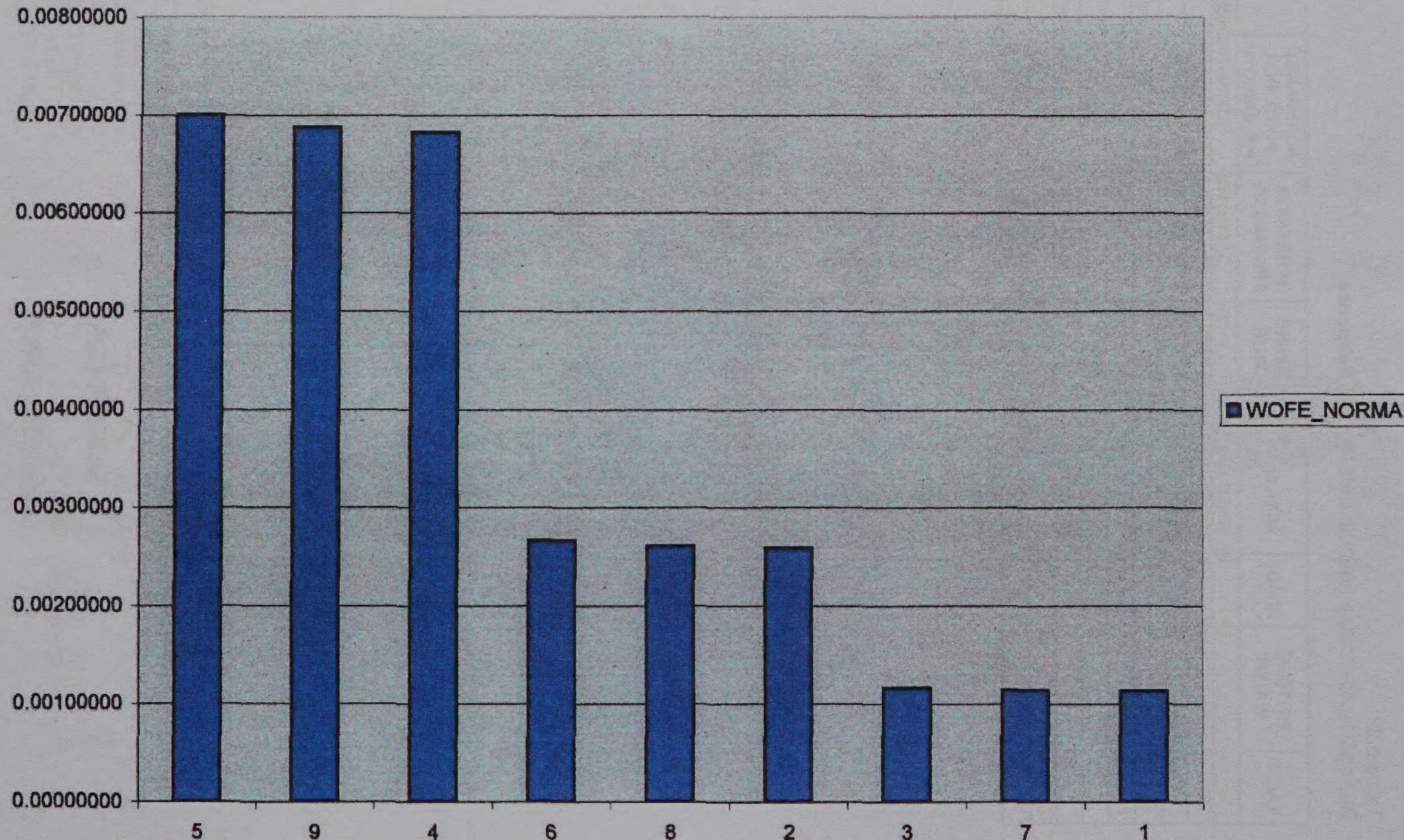


Table 5.23
Spring/Steptoe Analytic Unit Model Summary Historic Response

	High	Medium	Low	Total
Model area (m^2)	3527228706.14	113945.85	10259808463.16	13787151115.15
Model area (km^2)	3527.23	0.11	10259.81	13787.15
% Model area	25.58%	0.00%	74.42%	100.00%
All sites area (m^2)	5887202.00	0.00	1654076.63	7541278.63
All sites area (km^2)	5.89	0.00	1.65	7.54
% site area	78.07%	0.00%	21.93%	100.00%
All site area / model area	**0.0017**	**0.0000**	**0.0002**	**0.0005**
Inventory area (m^2)	157849264.00	0.00	229430336.00	387279600.00
Inventory area (km^2)	157.85	0.00	229.43	387.28
% Inventory area	40.76%	0.00%	59.24%	100.00%
% Model area inventoried	**4.48%**	**0.00%**	**2.24%**	**2.81%**
Inventory sites area (m^2)	1337560.38	0.00	651651.06	1989211.44
Inventory sites area (km^2)	1.34	0.00	0.65	1.99
% Inventory site area	67.24%	0.00%	32.76%	100.00%
Inv site area / inv area	**0.0085**	**0.0000**	**0.0028**	**0.0051**

Spring/Steptoe Analytic Unit Model Summary Historic Composite

	High (2)	Medium (1)	Low (0)	Total
Model area (m^2)	859979840.00	5939859456.00	6978998272.00	13778837568.00
Model area (km^2)	859.98	5939.86	6979.00	13778.84
% Model area	6.24%	43.11%	50.65%	100.00%
All sites area (m^2)	1426929.75	4950314.00	1163290.25	7540534.00
All sites area (km^2)	1.43	4.95	1.16	7.54
% Site area	18.92%	65.65%	15.43%	100.00%
All site area / model area	**0.0017**	**0.0008**	**0.0002**	**0.0005**
Inventory area (m^2)	46812380.00	180674176.00	159793040.00	387279596.00
Inventory area (km^2)	46.81	180.67	159.79	387.28
% Inventory area	12.09%	46.65%	41.26%	100.00%
% Model area inventoried	**5.44%**	**3.04%**	**2.29%**	**2.81%**
Inventory sites area (m^2)	561537.06	1027746.88	399927.59	1989211.53
Inventory sites area (km^2)	0.56	1.03	0.40	1.99
% Inventory site area	28.23%	51.67%	20.10%	100.00%
Inv site area / inv area	**0.0120**	**0.0057**	**0.0025**	**0.0051**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

Figure 5.42 Spring/Steptoe Valley Analytic Unit Observed Probability - Historic

Figure 5.43 Spring/Steptoe Valley Analytic Unit Composite Probability - Historic

Spring Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Composite
Low
Medium
High
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

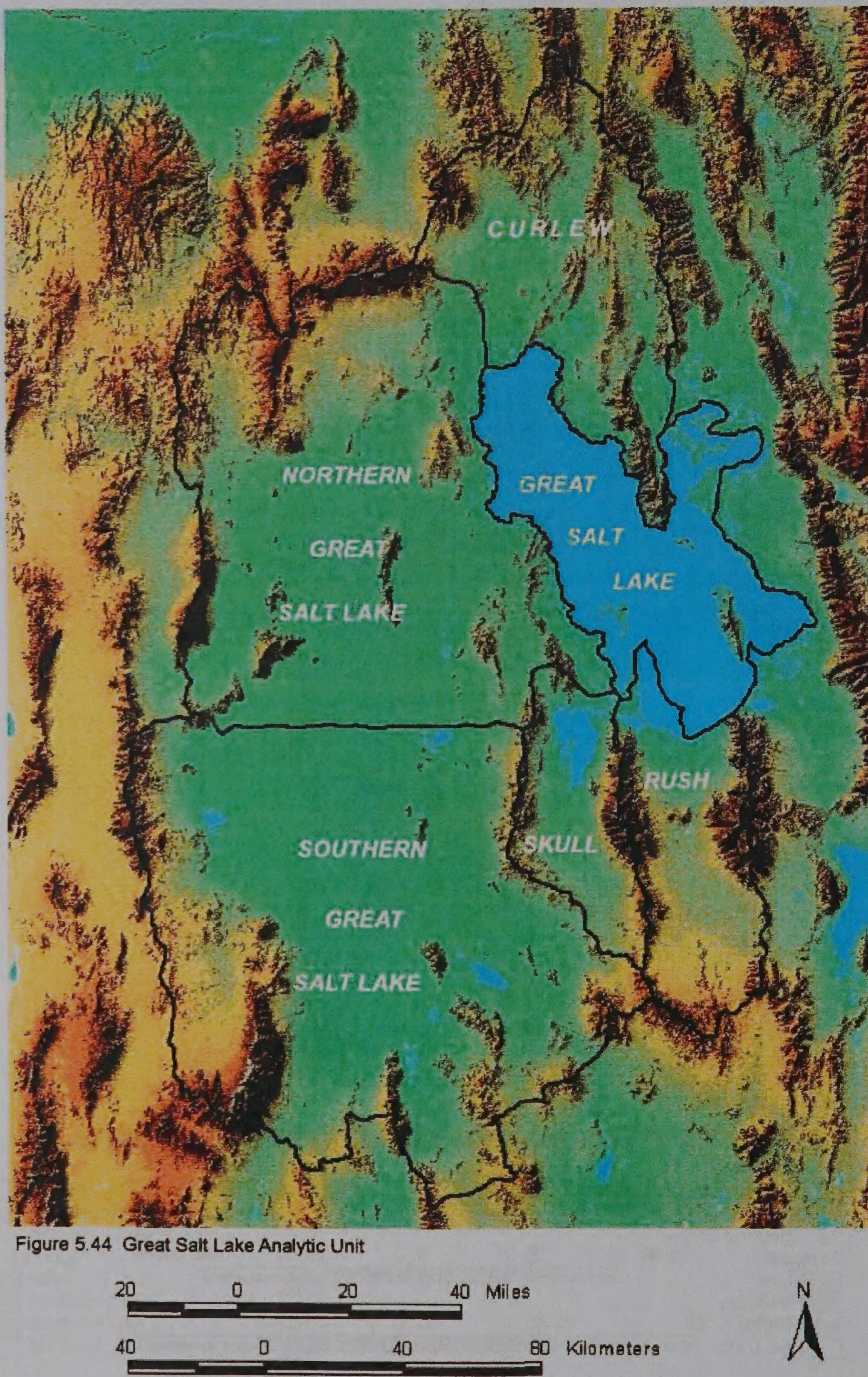


Figure 5.44 Great Salt Lake Analytic Unit

Figure 5.45 Extent of Lake Gilbert and Great Salt Lake Shorelines

Salt Lake Analytic Unit
Lake Gilbert - Great Salt Lake Extent
Great Salt Lake
Lake Gilbert

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Table 5.24
Great Salt Lake Analytic Unit Area

HYDROGRAPHIC UNIT NAME	SUBREGION	ACRES	HECTARES
Curlew Valley, Idaho, Utah	Great Salt Lake	1,257,783	509,009
Northern Great Salt Lake Desert, Nevada,Utah	Great Salt Lake	3,007,645	1,217,156
Great Salt Lake, Utah	Great Salt Lake	1,211,149	490,137
Rush-Tooele Valleys, Utah	Great Salt Lake	770,357	311,754
Skull Valley, Utah	Great Salt Lake	518,235	209,723
Southern Great Salt Lake Desert, Nevada, Utah	Great Salt Lake	3,525,768	1,426,833
	TOTAL	10,290,937	4,164,612

Curlew Valley

The Curlew Valley hydrographic unit lies in the northeastern portion of the Great Salt Lake analytic unit. The northern half of the sub-region lies within Idaho; the southern half within Utah. Several semi-bolsons comprise this hydrographic unit, all of which slope to the southwest and drain into the Great Salt Lake. (Figure 5.46) The hydrographic unit is relatively mountainous and is bounded by the Pleasantville Hills, Samaria Mountains, and the West Hills to the east. The Promontory Mountains and North Promontory Mountains define the southern extent of the Hydrographic unit. Portions of the Raft River Mountains, Black Pine Mountains extend into the Curlew Valley hydrographic unit along its western extent; the Sublett Range and Deep Creek Mountains extend into the hydrographic unit from the north. The Hansel Mountains and North Hansel Mountains extend south through the center of the hydrographic unit. Curlew Valley and Hansel Valley are the predominant lowland features of this hydrographic unit. Deep Creek, flowing through the upper portion of Curlew Valley is the dominant hydrographic feature. The Curlew National Grasslands lie in the upper portion of Curlew Valley, where the Sublett Range, Deep Creek Mountains, Pleasantville Hills, and North Hansel Mountains merge to form a narrow, well-watered basin.

Elevations within the Curlew Valley hydrographic unit range from 2429 meters in the Deep Creek Mountains to 1285 meters at the Great Salt Lake. Curlew Valley averages 1400 meters across its broad southern extent. The upper narrower portion lies at approximately 1580 meters. Scattered pinyon/juniper woodlands with a sagebrush understory occur on the upper slopes of the surrounding and interior mountains. Lowlands range from barren to sparse shadscale communities.

Wetlands are common along the southern periphery of the Curlew hydrographic unit. The Bear River National Wetlands extends along the eastern side of the Promontory Mountains and the Great Salt Lake. Rozel Flat lies west of the Promontory Mountains and the Locomotive Springs State Wildlife Management Area occurs at the delta of Deep Creek and the Great Salt Lake.

Northern Great Salt Lake Desert

The Northern Great Salt Lake Desert hydrographic unit encompasses the northern half of the Great Salt Lake Desert. (Figure 5.47) Only the extreme western edge of the hydrographic unit lies within Nevada. Its eastern edge borders the Great Salt Lake while Interstate 80 arbitrarily bound the southern boundary. The Pilot Range, Goose Creek Mountains and Raft River Mountains define the western and northern periphery, respectively. The Leppy Hills lie in the southwest corner of the hydrographic unit. Elevations range from 1285 meters on the desert floor to 2600 meters in the Pilot Range and 2598 meters at Ingham Peak in the Grouse Creek Mountains. Several small ranges lie scattered about the northern Great Salt Lake Desert rising as high as 2300 meters. The 1295 meter shoreline of Lake Gilbert (10,500 B.P.) roughly defines the edge of the Great Salt Lake Desert sand sheet. The Gilbert shoreline and others marking the Lake Bonneville recession are visible along the western ranges and mountain "islands" throughout the hydrographic basin.

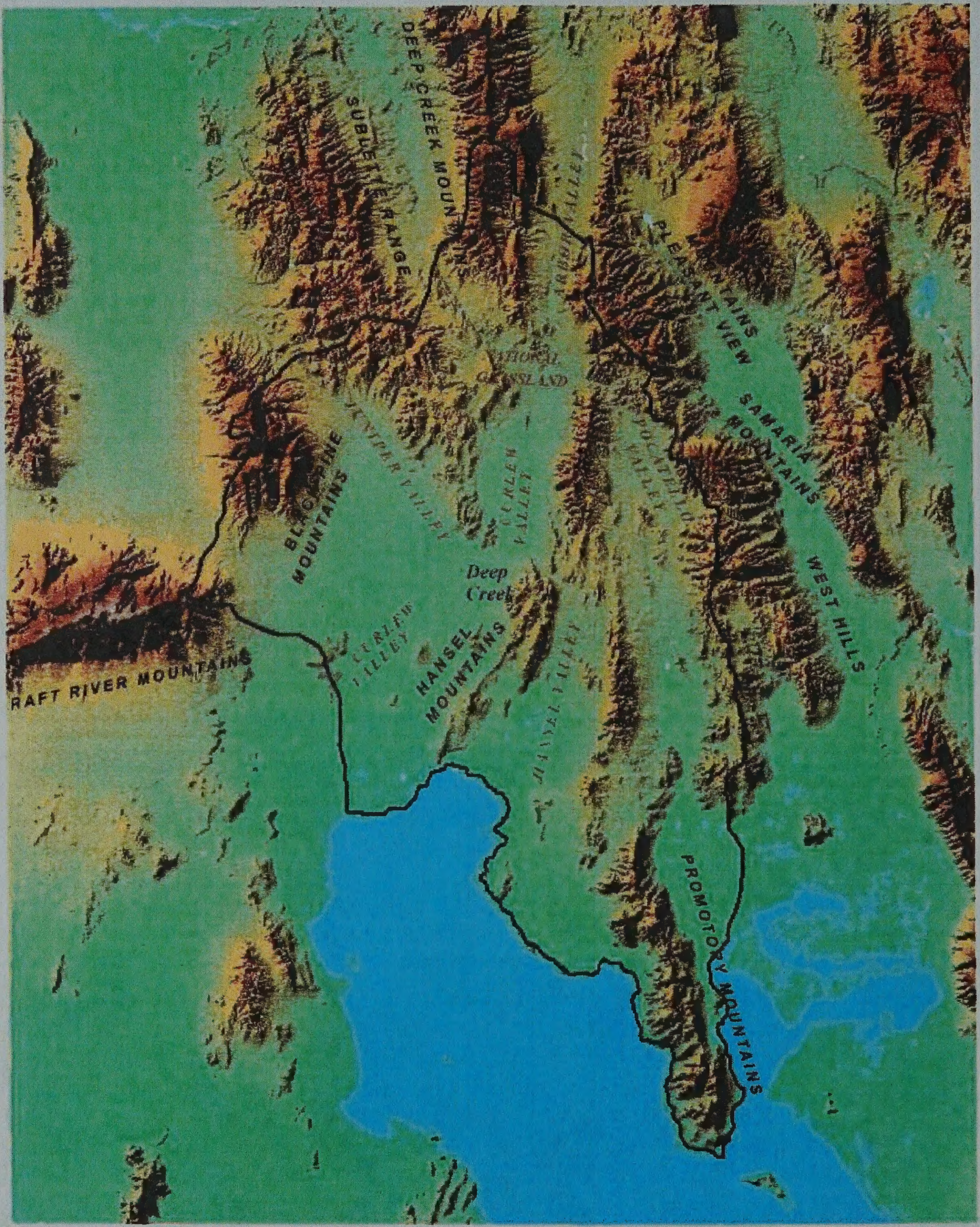
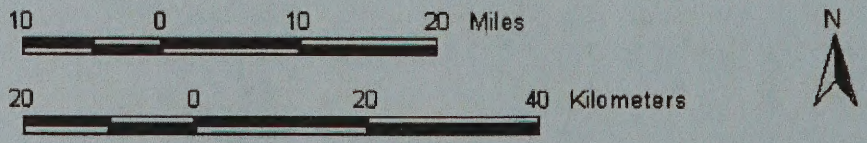


Figure 5.46 Great Salt Lake Analytic Unit - Curlew Valley Hydrographic Unit



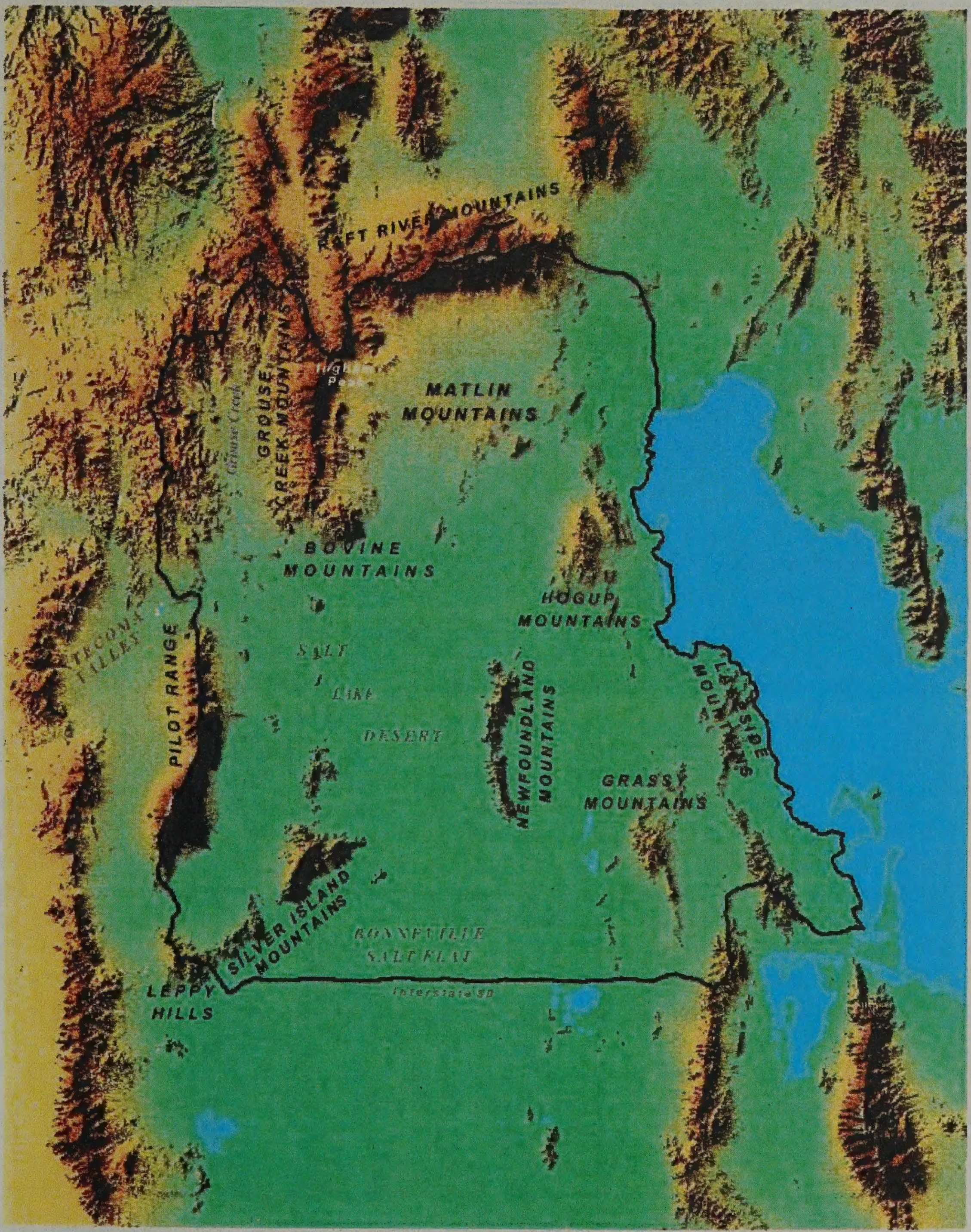


Figure 5.47 Great Salt Lake Analytic Unit - Northern Great Salt Lake Hydrographic Unit

10 0 10 20 Miles

20 0 20 40 Kilometers

N

Surrounding mountain slopes drain south and east into the Great Salt Lake Desert. Grouse Creek Valley and Tecoma Valley provide most consistent drainage systems but both terminate at the edge of the desert. Lowlands along the western edge of the Grassy Mountains sustain a viable marsh environment.

Scattered pinyon/juniper woodlands occur in uplands of the highest interior mountains and along the bordering western ranges. As elevation decreases, sagebrush gives way to saltbrush communities while most of the bottomlands are barren.

Great Salt Lake

The Great Salt Lake hydrographic unit lies wholly within the current extent of the Great Salt Lake. (Figure 5.48) Mean elevation for the lake during September 1984 was 1282 meters. Land along the periphery of the Great Salt Lake hydrographic unit, if present, consist of sandy beach or salt flat. The Bear River and Farmington wetlands border the hydrographic unit, but lie outside of its boundaries. Three islands Firemans Island, Antelope Island, and Carrington Island, are prominent topographic features in the southern part of the lake. The Promontory Mountains form a peninsula within the north-central portion of the hydrographic unit and vegetation is sparse to barren.

Rush-Tooele Valleys

Rush and Tooele valleys are typical of the north-south trending valleys commonly associated with the Great Basin. This hydrographic unit lies south of the Great Salt Lake. (Figure 5.49) and consists of the Tooele Valley, a broad open flat sloping northward into the Great Salt Lake, and Rush Valley, a larger enclosed basin to the south. The hydrographic unit is bounded by the Stansbury and Onaou mountains to the west, the Sheeprock Mountains and West Tintic Mountains in the south and the Oquirra Mountains to the east. South Mountain (2011 meters) divides Tooele and Rush Valleys. Deseret Peak (3362 meters) in the Stansbury Mountains and Flat Top Mountain (3237 meters) in the Quirra Mountains provide the highest relief along the hydrographic unit boundary. The Tooele Valley continues sloping northward from South Mountain with elevations ranging from 1600 meters to 1285 meters at the Great Salt Lake. Mud flats and sand sheets dominate the northern portion of the Tooele Valley as it juts into the Great Salt Lake. Stansbury Island is a prominent peninsula at the extreme northern end of the valley.

Hydrologically, Rush-Tooele Valley is characterized by steep, well-watered canyons draining into the valley floor from the surrounding ranges. Small wetlands and ponds lie at the 1520 meter elevation below South Mountain in the northern part of Rush Valley. Wetlands also lie at the north end of the Stansbury Mountains and several sloughs grade into the mud flats at the north end of Tooele Valley. Vegetation ranges from limber pine at highest elevations, pinyon/juniper woodland on slopes above mountain pediments, to barren mud flats at lowest elevations.

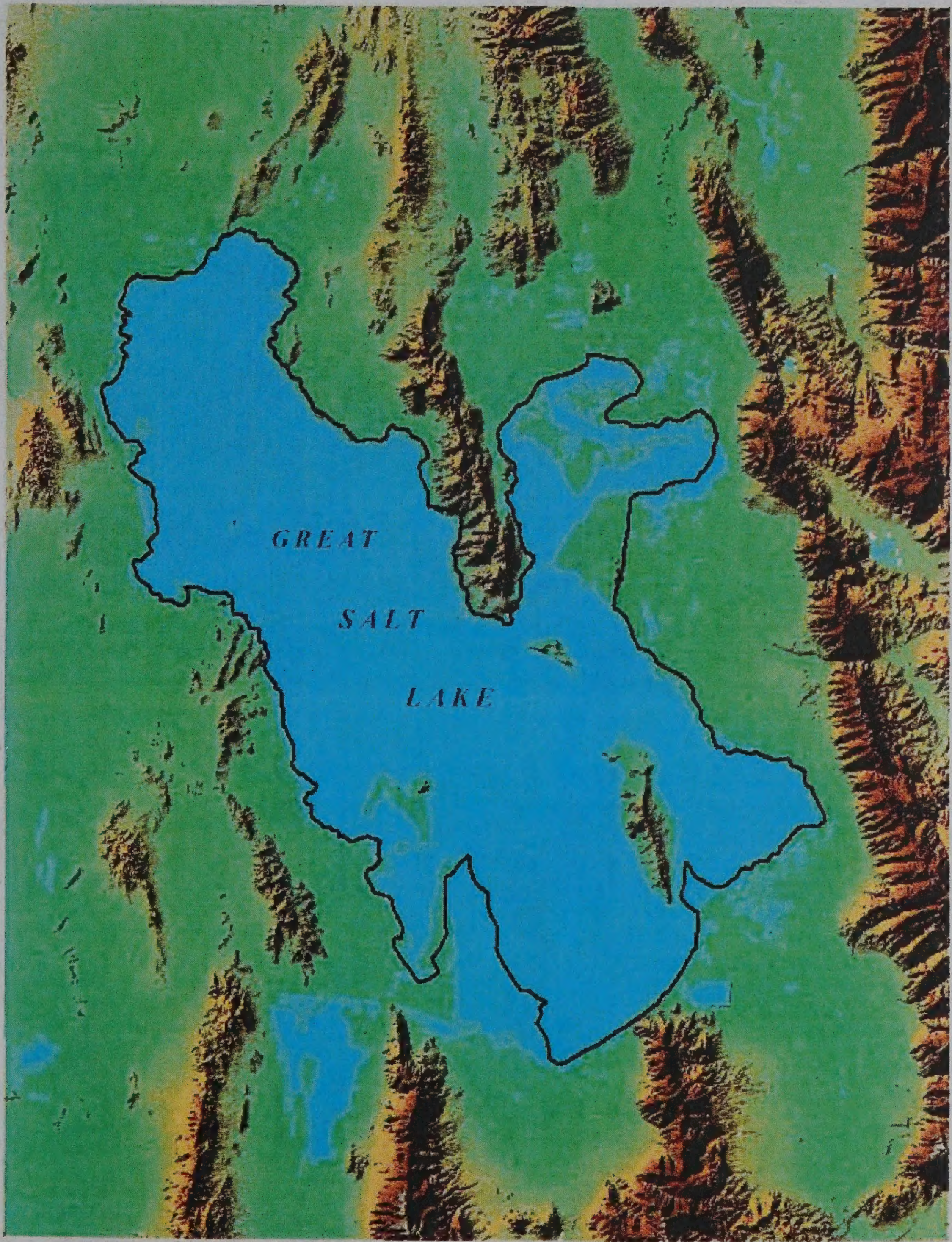
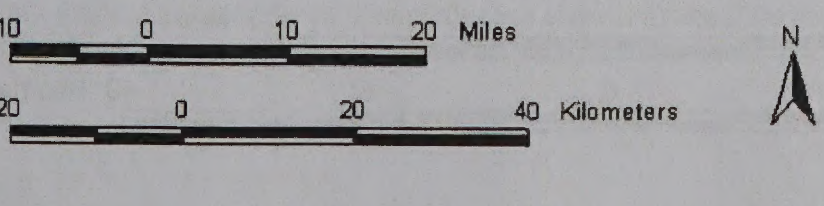


Figure 5.48 Great Salt Lake Analytic Unit - Great Salt Lake Hydrographic Unit



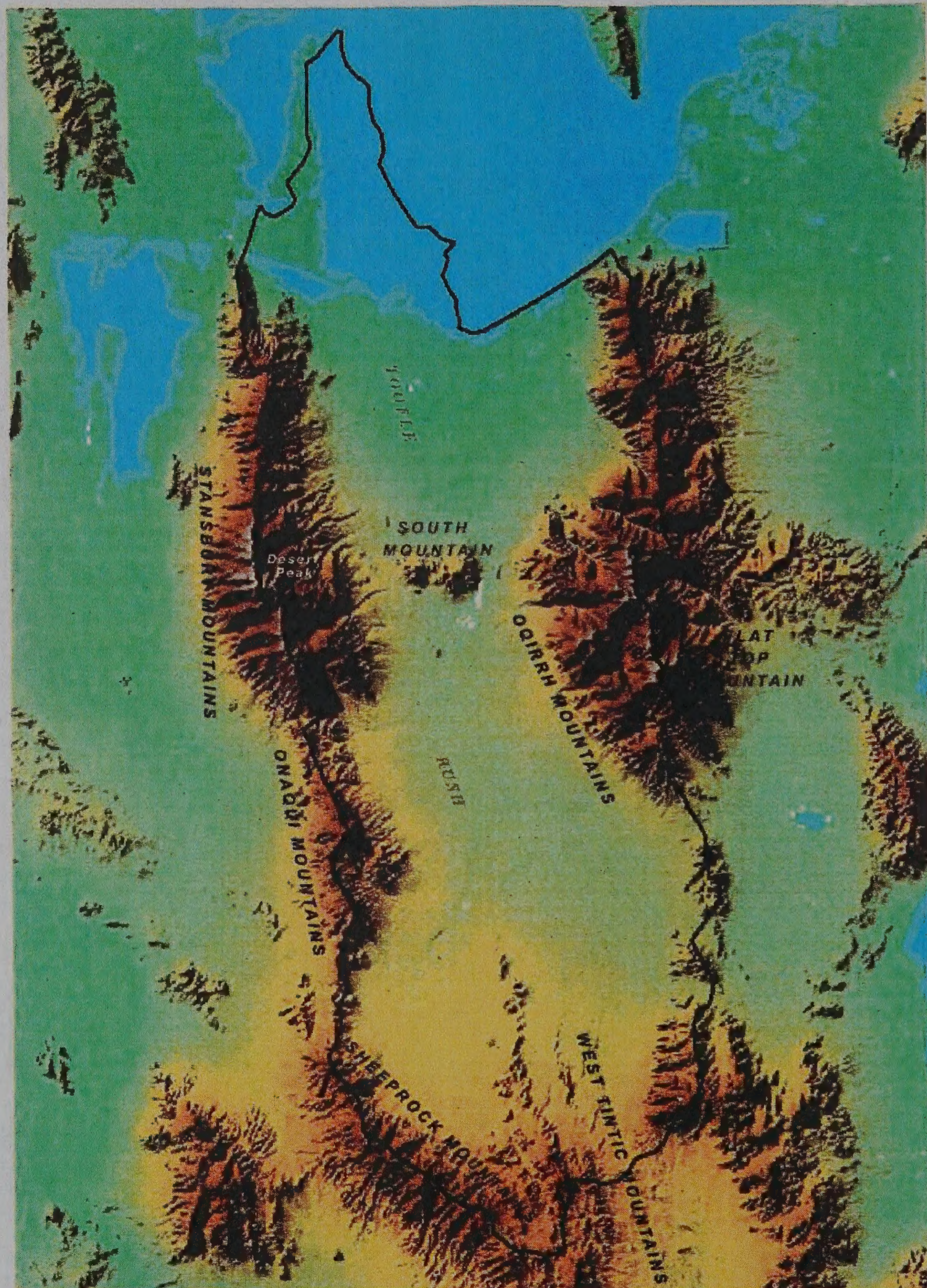


Figure 5.49 Great Salt Lake Analytic Unit - Rush/Toole Valley Hydropraphic Unit

10 0 10 20 Miles

20 0 20 40 Kilometers

Skull Valley

The Skull Valley hydrographic unit lies west of Rush-Tooele Valleys, with the crest of the Stansbury Range as a common boundary. (Figure 5.50) The Cedar Mountains rising to 2300 meters, define the hydrographic units western extent, while the Sheeprock Mountains and Davis Mountain trend southeasterly to form a southern boundary. The Lakeside Mountains form a partial northern boundary. Elevation of the valley floor ranges from 1525 meters in the south to 1285 meters in the north where it enters the Great Salt Lake. Extensive mud flats dominate the valley floor below 1300 meters in the northern half of Skull Valley.

Deep canyons along the west slope of the Stansbury Range provide substantial hydrologic inflow, sustaining drainages that eventually flow through the mud flats to the Great Salt Lake. Less competent drainages in the Cedar Mountains characterize the hydrologic regime along the valleys drier west side. Vegetation ranges from barren on the mud flats to desert shrub on the valley floor with pinyon/juniper and sagebrush on the mountain slopes.

Southern Great Salt Lake Desert

This hydrographic unit is the southern extension of the Northern Great Salt Lake Desert hydrographic unit. (Figure 5.51) It shares similar characteristics; dry mud flats and a sand sheet comprise most of the unit, but fewer "islands" occur within its interior. The Goshute Mountains, Ferber Hills, and Deep Creek Range form the western boundary of the Southern Great Salt Lake Desert. The Leppy Hills and Danger Cave mark the extreme northwest corner of the hydrographic unit. To the east, the hydrographic unit boundary is shared with the ranges bordering Skull Valley. Several low, north-trending ranges extend into the Great Salt Lake Desert, creating the hydrographic unit's southern boundary. Deep Creek Valley, Snake Valley, Fish Springs Flat, and Dugway Valley lie between these southern ranges and drain northward into the desert. White Horse Flat and related badlands lie between the Goshute Mountains and Ferber Hills. Highest elevations occur within the Goshute Mountains, with Goshute Peak rising to 2929 meters. Southern valleys slope northward with highest elevations between 1600 and 1550 meters. The desert floor where at the boundary with Northern Great Salt Lake Desert is 1285 meters. Wildcat Mountain and Granite Peak (2154 meters) are "island" features within the hydrographic unit.

Intermittent streams originating in the surrounding mountains provide water flow into the hydrographic basin. Sustainable wetlands occur at the north end of White Horse Flat where Felt Wash, originating in the Goshute Mountains, enters the Great Salt Lake Desert mud flats. That marsh lies at 1290 meters. Numerous springs feed the lowlands of Fish Springs Flat at an elevation of 1309 meters along the eastern terminus of the Fish Springs Range and the Fish Springs Wash delta.

Vegetation is typical of the Great Salt Lake Desert. Lowest elevations are barren mud flats and sand sheets, grading to desert shrub communities as elevation rises from the desert floor. Pinyon/juniper uplands grade sagebrush communities along alluvial fans.

Figure 5.50 Great Salt Lake Analytic Unit - Skull Valley Hydrographic Unit

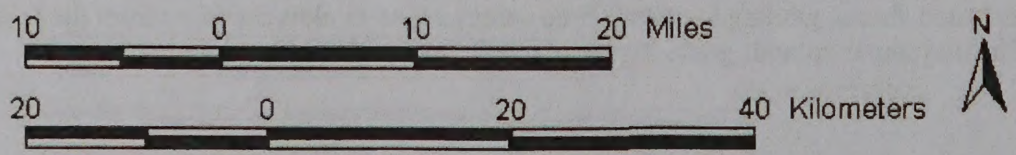


Figure 5.51 Great Salt Lake Analytic Unit - Southern Great Salt Lake Hydrographic Unit

10 0 10 20 Miles

20 0 20 40 Kilometers

N

Analytic Results

Prehistoric Evidential Themes

Approximately 1062 square kilometers, 2.5% of the total area, were inventoried within the Great Salt Lake analytic unit. (Table 5.25) (Figure 5.52) Three hundred eleven sites from those inventories were considered in the weighted analysis. One thousand one hundred sixteen sites are reported for the entire analytic unit.

Within all analytic classes, only Great Basin pine, Juniper steppe and Wet grassland classes within the vegetation evidential theme have not been inventoried. (Table 5.26) The total extent of the missing class area is 202 square kilometers (0.4% of the total analytic area). Inventoried space in several zones, including chaparral and water in the vegetation theme, mountain areas in landform and slopes greater than 15 degrees are under-represented within the inventoried sample. When evaluating weighted contrasts, sampling inconsistencies and site densities relative to the model area data set as well as inventoried data sets were considered.

Weights of evidence tables identify classes within each evidential theme that lie "inside" of the predictive pattern. (Table 5.26) Normalized contrast for juniper/pinyon vegetation class is highest when evaluated with all categories of prehistoric sites. Chi-square is also significantly high for the class. Barren areas, or those with sparse vegetation, have a correspondingly high negative contrast value, indicating a lower than expected probability for sites. By contrast, barren areas have the highest contrast for non-sites. (Figure 5.53)

Contrasts for distance to springs and streams is variable across each different analytic run. When all sites are considered, the 200 meter buffer has the highest contrast. When inventoried sites are weeded, the 400 meter buffer distance has the highest contrast, while the sites within 250 meter cells have highest contrasts in areas greater then 2000 meters. The large expanse of desert within the Great Salt Lake analytic unit and peculiarities of the weeding process appear to be driving the contrast results. Since the weighted results are inconsistent across all analytic runs, distance to water was not included as a predictive theme. (Figure 5.54)

Proximity of sites to wetlands, on the other hand, uniformly identifies the 0 to 1000 meter buffer as a reliably predictive class. (Figure 5.55) In the three analytic runs with sites, the 1000 meter buffer exhibits the highest contrast values. Corresponding negative values are present in the non-site analysis. Site location more than 5000 meters from potential wetlands is inconsistently identified in the weights tables. Relatively high contrasts in weeded all site and inventoried site analysis, likely reflect an upland adaptation within the analytic unit.

Like distance to streams and springs, analytic runs for slope are less than conclusive. Contrast values for slopes 15 to 30 degrees are based upon a relatively high frequency of sites within a slope class that accounts for less than 1% of the analytic unit. Those sites are most likely rockshelters. Contrast for slope between 5 and 15 degrees is also relatively high, but chi-square calculations suggest that the distribution of sites within that class is normal.

Table 5.25
Great Salt Lake Analytic Unit Inventory Summary

Potential Vegetation

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
2	Great Basin pine	11.25	0	0.00	0.00%	0
22	Juniper/pinyon	4919.94	288	123.88	2.52%	97
23	Juniper steppe	189.88	2	0.00	0.00%	0
25	Sagebrush	7155.84	281	96.44	1.35%	32
26	Chaparral	133.93	2	0.78	0.58%	0
28	Desert shrub	11128.76	307	354.69	3.19%	72
38	Wet grassland	0.92	0	0.00	0.00%	105
62	Barren	11745.21	220	453.12	3.86%	0
63	Water	6089.84	11	29.76	0.49%	0
9999	Missing data	132.30	2	2.38	1.80%	0
-99	No data	136.02	3	1.14	0.83%	0
	Total	41643.90	1116	1062.18	2.55%	306

Streams and Springs

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	7818.19	350	172.30	2.20%	62
400	200-400m	6308.22	201	128.42	2.04%	50
1000	400-1000m	10296.09	274	209.12	2.03%	51
2000	1000-2000m	5102.81	95	123.19	2.41%	23
9999	>2000m	12120.53	196	429.15	3.54%	120
	Total	41645.85	1116	1062.18	2.55%	306

Potential Wetlands

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1000	0-1000m	5138.75	205	201.61	3.92%	76
3000	1000-3000m	7331.14	146	244.81	3.34%	57
5000	3000-5000m	5568.04	78	181.72	3.26%	28
9999	>5000m	23606.57	687	434.04	1.84%	145
-99	No data	0.00	0	0.01	0.00%	0
	Total	41644.49	1116	1062.18	2.55%	306

Landform

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
1	Flat	30181.96	597	869.39	2.88%	199
2	Piedmont	5435.87	322	133.86	2.46%	81
3	Mountain	6028.23	197	58.94	0.98%	31
	Total	41646.06	1116	1062.18	2.55%	311

Slope

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
0-5	degrees	37251.69	893	1007.99	2.71%	262
5-15	degrees	3960.48	189	49.99	1.26%	40
15-30	degrees	427.05	34	4.14	0.97%	4
30-45	degrees	3.22	0	0.02	0.65%	0
>45	degrees	0.05	0	0.05	102.85%	0
	Total	41642.49	1116	1062.18	2.55%	306

Summary Vegetation

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Great Basin pine	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Juniper/pinyon	30611	12388	97	0.0032	0.3169	315.5796	0.0078	0.7830	127.7105
Juniper steppe	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sagebrush	23830	9644	32	0.0013	0.1343	744.7015	0.0033	0.3318	301.3700
Chaparral	192	78	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Desert shrub	87646	35469	72	0.0008	0.0821	1217.3092	0.0020	0.2030	492.6275
Wet grassland	0	0	105	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Barren	111968	45312	0	0.0009	0.0938	1066.3643	0.0023	0.2317	431.5423
Water	7354	2976	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Missing data	589	238	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No data	280	114	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	262191	106105	306	0.0012	0.1167	856.8323	0.0029	0.2884	346.7477

Summary Water

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	42575	17230	62	0.0015	0.1456	686.6943	0.0036	0.3598	277.8953
200-400m	31734	12842	50	0.0016	0.1576	634.6724	0.0039	0.3893	256.8428
400-1000m	51676	20912	51	0.0010	0.0987	1013.2528	0.0024	0.2439	410.0488
1000-2000m	30442	12319	23	0.0008	0.0756	1323.5696	0.0019	0.1867	535.6296
>2000m	106045	42915	120	0.0011	0.1132	883.7043	0.0028	0.2796	357.6224
Total	262471	106218	306	0.0012	0.1166	857.7490	0.0029	0.2881	347.1187

Summary Wetland

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	49620	20161	76	0.0015	0.1525	655.5280	0.0038	0.3770	265.2828
1000-3000m	60494	24481	57	0.0009	0.0942	1061.3025	0.0023	0.2328	429.4939
3000-5000m	44903	18172	28	0.0006	0.0624	1603.6726	0.0015	0.1541	648.9832
>5000m	107253	43404	145	0.0014	0.1352	739.6735	0.0033	0.3341	299.3352
No data	1	1	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	262470	106218	306	0.0012	0.1166	857.7447	0.0029	0.2881	347.1169

Summary Landform

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
Flat	214830	86939	199	0.0009	0.0926	1079.5495	0.0023	0.2289	436.8781
Piedmont	33077	13386	81	0.0024	0.2449	408.3563	0.0061	0.6051	165.2559
Mountain	14564	5894	31	0.0021	0.2129	469.8056	0.0053	0.5260	190.1235
Total	262471	106218	311	0.0012	0.1185	843.9588	0.0029	0.2928	341.5380

Summary Slope

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-5°	249079	100799	262	0.0011	0.1052	950.6829	0.0026	0.2599	384.7277
5-15°	12352	4999	40	0.0032	0.3238	308.7984	0.0080	0.8002	124.9663
15-30°	1023	414	4	0.0039	0.3911	255.6614	0.0097	0.9665	103.4625
30-45°	5	2	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
>45°	13	5	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	262471	106218	306	0.0012	0.1166	857.7490	0.0029	0.2881	347.1187

Roads (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	6637.49	131	210.07	3.16%	43
400	200-400m	4922.41	23	136.39	2.77%	4
600	400-600m	3846.36	11	104.63	2.72%	2
800	600-800m	3068.84	9	78.67	2.56%	3
1000	800-1000m	2444.59	9	59.65	2.44%	3
9999	>1000m	20726.34	20	472.77	2.28%	6
-99	No data	0.00	0	0.00	0.00%	0
	Total	41646.03	203	1062.18	2.55%	61

Water (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.km	% Inventory	Inv. # Sites
200	0-200m	7818.19	58	172.30	2.20%	13
400	200-400m	6308.22	27	128.42	2.04%	13
1000	400-1000m	10296.09	65	209.12	2.03%	18
9999	>1000m	17223.35	53	552.34	3.21%	17
-99	No data	0.21	0	0.00	0.00%	61
	Total	41646.06	203	1062.18	0.00%	122

Summary Inventoried Roads (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-200m	51909	21007	43	0.0008	0.0828	1207.1788	0.0020	0.2047	488.5279
200-400m	33702	13639	4	0.0001	0.0119	8425.5528	0.0003	0.0293	3409.7000
400-600m	25856	10463	2	0.0001	0.0077	12927.8503	0.0002	0.0191	5231.7150
600-800m	19439	7867	3	0.0002	0.0154	6479.6472	0.0004	0.0381	2622.2200
800-1000m	14741	5965	3	0.0002	0.0204	4913.6662	0.0005	0.0503	1988.4900
>1000m	116824	47277	6	0.0001	0.0051	19470.7400	0.0001	0.0127	7879.5283
No data	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	262471	106218	61	0.0002	0.0232	4302.8058	0.0006	0.0574	1741.2836

Summary Water (Historic)

	Inv. Acres	Inv. Hectares	Inv.Sites	Sites/InvAcre	Sites/100InvAcre	InvAcre/site	Sites/InvHa	Sites/100InvHa	InvHa/site
0-1000m	42575	17230	13	0.0003	0.0305	3275.0038	0.0008	0.0755	1325.3469
1000-3000m	31734	12842	13	0.0004	0.0410	2441.0478	0.0010	0.1012	987.8569
3000-5000m	51676	20912	18	0.0003	0.0348	2870.8829	0.0009	0.0861	1161.8050
>5000m	136487	55234	17	0.0001	0.0125	8028.6245	0.0003	0.0308	3249.0688
No data	0	0	61	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	262471	106218	61	0.0002	0.0232	4302.8062	0.0008	0.0574	1741.2838

Figure 5.52 Great Salt Lake Analytic Unit - Inventories and Prehistoric Sites

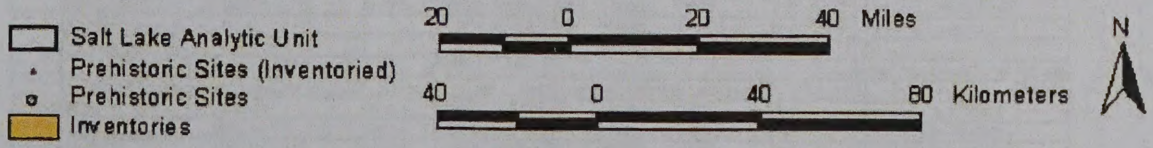


Table [illegible].26
Great Salt Lake Analytic Unit Prehistoric Evidential Theme Weights/Chi-Square

Theme Weight

ALL SITES

Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	#Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	11	45	0	0	0.0000	0.0000	0.0000	0.0000	0.00
22	Juniper/pinyon	4920	19680	222	288	0.6993	-0.1453	0.8447	0.0772	10.9381
23	Juniper steppe	190	760	1	2	-1.4588	0.0035	-1.4622	1.0012	-1.4604
25	Sagebrush	7156	28623	254	281	0.4570	-0.1281	0.5851	0.0738	7.9280
26	Chaparral	134	536	2	2	-0.4168	0.0011	-0.4179	0.7092	-0.5893
28	Desert shrub	11129	44515	269	307	0.0701	-0.0269	0.0970	0.0724	1.3389
36	Wet grassland	1	4	0	0	0.0000	0.0000	0.0000	0.0000	0.00
62	Barren	11745	46981	177	220	-0.4050	0.1238	-0.5288	0.0836	-6.3215
63	Water	6090	24359	9	11	-2.7306	0.1500	-2.8806	0.3350	-8.5983
9999	Missing data	132	529	2	2	-0.4020	0.0011	-0.4031	0.7092	-0.5684
-99	No data	136	544	0	3	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41644		936	1116					

Inventoried Potential Vegetation

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
22	Juniper/pinyon	124	496	82	97	0.9910	-0.2205	1.2115	0.1403	8.64
23	Juniper steppe	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
25	Sagebrush	96	386	30	32	0.1359	-0.0145	0.1504	0.2006	0.75
26	Chaparral	1	3	0	0	0.0000	0.0000	0.0000	0.0000	0.00
28	Desert shrub	355	1419	78	72	-0.2353	0.1022	-0.3375	0.1365	-2.47
62	Barren	453	1812	101	105	-0.2210	0.1410	-0.3620	0.1273	-2.84
63	Water	30	119	0	0	0.0000	0.0000	0.0000	0.0000	0.00
9999	Missing data	2	10	0	0	0.0000	0.0000	0.0000	0.0000	0.00
-99	No data	1	5	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	938		209	306					

Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
22	Juniper/pinyon	124	1982	97	97	0.4430	-0.0750	0.5179	0.1147	4.52
25	Sagebrush	96	1543	44	32	-0.1184	0.0111	-0.1295	0.1596	-0.81
26	Chaparral	1	12	0	0	0.0000	0.0000	0.0000	0.0000	0.00
28	Desert shrub	355	5675	186	72	0.0252	-0.0129	0.0381	0.0919	0.41
62	Barren	453	7250	210	105	-0.1023	0.0703	-0.1726	0.0895	-1.93
63	Water	30	476	1	0	-2.7536	0.0275	-2.7811	1.0020	-2.78
9999	Missing data	2	38	5	0	1.5197	-0.0072	1.5269	0.4818	3.17
-99	No data	1	18	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		543	306					

Non Site 250 Grid Potential Vegetation

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
22	Juniper/pinyon	124	1982	1863	97	-0.2928	0.0452	-0.3380	0.1028	-3.29
25	Sagebrush	96	1543	1454	32	-0.2498	0.0284	-0.2781	0.1160	-2.40
26	Chaparral	1	12	12	0	0.2357	-0.0002	0.2359	1.5155	0.16
28	Desert shrub	355	5675	5368	72	-0.1819	0.1041	-0.2859	0.0754	-3.79
62	Barren	453	7250	6997	105	0.2772	-0.1689	0.4460	0.0783	5.70
63	Water	30	476	475	0	2.9825	-0.0283	3.0108	0.9353	3.22
9999	Missing data	2	38	35	0	-0.6214	0.0019	-0.6232	0.5931	-1.05
-99	No data	1	18	10	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		16214	306					

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	7818	31273	307	350	0.5611	-0.1900	0.7512	0.0699	10.75
400	200-400m	6308	25233	154	201	0.0821	-0.0154	0.0975	0.0884	1.10
1000	400-1000m	10296	41184	232	274	0.0015	-0.0005	0.0020	0.0759	0.03
2000	1000-2000m	5103	20411	81	95	-0.3505	0.0405	-0.3910	0.1165	-3.36
9999	>2000m	12121	48482	163	196	-0.5169	0.1538	-0.6707	0.0863	-7.77
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41645		937	1116					

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	689	56	62	0.1847	-0.0394	0.2241	0.1549	1.45
400	200-400m	128	514	49	50	0.3606	-0.0595	0.4201	0.1643	2.56
1000	400-1000m	209	836	53	51	-0.0834	0.0196	-0.1029	0.1570	-0.66
2000	1000-2000m	123	493	22	23	-0.4532	0.0480	-0.5013	0.2271	-2.21
9999	>2000m	429	1717	111	120	-0.0616	0.0400	-0.1016	0.1250	-0.81
	Total	1062		291	306					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	2757	82	62	-0.0738	0.0137	-0.0875	0.1217	-0.72
400	200-400m	128	2055	73	50	0.1098	-0.0160	0.1258	0.1281	0.98
1000	400-1000m	209	3346	94	51	-0.1328	0.0301	-0.1628	0.1151	-1.41
2000	1000-2000m	123	1971	41	23	-0.4407	0.0463	-0.4870	0.1642	-2.97
9999	>2000m	429	6866	253	120	0.1476	-0.1131	0.2607	0.0875	2.98
	Total	1062		543	306					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	2757	2625	62	-0.0410	0.0081	-0.0491	0.0979	-0.50
400	200-400m	128	2055	1930	50	-0.2941	0.0473	-0.3414	0.1006	-3.39
1000	400-1000m	209	3346	3214	51	0.1593	-0.0358	0.1951	0.0975	2.00
2000	1000-2000m	123	1971	1904	23	0.3121	-0.0351	0.3472	0.1300	2.67
9999	>2000m	429	6866	6541	120	-0.0322	0.0224	-0.0546	0.0743	-0.73
		1062		16214	306					

Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	5139	20555	173	205	0.3940	-0.0702	0.4642	0.0844	5.50
3000	1000-3000m	7331	29325	128	146	-0.2666	0.0489	-0.3155	0.0953	-3.31
5000	3000-5000m	5568	22272	68	78	-0.6254	0.0695	-0.6949	0.1261	-5.51
9999	>5000m	23607	94426	579	687	0.0750	-0.1074	0.1825	0.0668	2.73
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41645		948	1116					

Inventoried Potential Wetlands

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	202	806	73	76	0.3028	-0.0839	0.3866	0.1413	2.74
3000	1000-3000m	245	979	55	57	-0.2115	0.0565	-0.2680	0.1544	-1.74
5000	3000-5000m	182	727	28	28	-0.6071	0.0931	-0.7003	0.2031	-3.45
9999	>5000m	434	1736	135	145	0.1369	-0.1050	0.2419	0.1219	1.98
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		291	306					

Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	202	3226	164	76	0.4842	-0.1536	0.6378	0.0956	6.67
3000	1000-3000m	245	3917	126	57	0.0070	-0.0021	0.0091	0.1033	0.09
5000	3000-5000m	182	2907	32	28	-1.0871	0.1314	-1.2185	0.1834	-6.64
9999	>5000m	434	6945	221	145	-0.0041	0.0028	-0.0070	0.0888	-0.08
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		543	306					

Non Site 250 Grid Potential Wetlands

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	202	3226	3031	76	-0.2888	0.0801	-0.3689	0.0851	-4.33
3000	1000-3000m	245	3917	3747	57	0.0598	-0.0173	0.0770	0.0887	0.87
5000	3000-5000m	182	2907	2845	28	0.7858	-0.1096	0.8954	0.1335	6.70
9999	>5000m	434	6945	6591	145	-0.1079	0.0812	-0.1891	0.0736	-2.57
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		16214	306					

Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	37252	149007	761	893	-0.1013	0.5995	-0.7009	0.0833	-8.42
5-15	degrees	3960	15842	154	189	0.5470	-0.0792	0.6262	0.0885	7.07
15-30	degrees	427	1708	26	34	1.0009	-0.0178	1.0187	0.2004	5.08
30-45	degrees	3	13	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
9999	Missing data	4	14	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41646		941	1116					

Inventoried Slope

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	1008	4032	249	262	-0.1107	1.1842	-1.2949	0.1839	-7.04
5-15	degrees	50	200	39	40	1.1926	-0.1024	1.2950	0.1900	6.82
15-30	degrees	4	17	3	4	1.1020	-0.0069	1.1090	0.6410	1.73
30-45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		291	306					

Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	1008	16128	504	262	-0.0229	0.3555	-0.3783	0.1700	-2.23
5-15	degrees	50	800	33	40	0.2654	-0.0150	0.2804	0.1834	1.53
15-30	degrees	4	66	6	4	1.1049	-0.0074	1.1123	0.4303	2.58
30-45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
0->45	degrees	0	1	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		543	306					

Non Site 250 Grid Slope

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	1008	16128	15407	262	0.0291	-0.4366	0.4657	0.1390	3.35
5-15	degrees	50	800	740	40	-0.5172	0.0329	-0.5502	0.1397	-3.94
15-30	degrees	4	66	66	4	2.6858	-0.0038	2.6896	2.1520	1.25
30-45	degrees	0	0	1	0	0.0000	-0.0009	0.0000	0.0000	0.00
>45	degrees	0	1	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		16214	306					

Landform

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	30182	120728	504	597	-0.3113	0.5355	-0.8468	0.0653	-12.96
2	Piedmont	5436	21743	282	322	0.8311	-0.2143	1.0454	0.0714	14.64
2	Mountain	6028	24113	162	197	0.1670	-0.0312	0.1982	0.0866	2.29
		41646		948	1116					

Inventoried Landform										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	869	13910	187	199	-0.2457	0.6945	-0.9402	0.1240	-7.58
2	Piedmont	134	2142	75	81	0.7338	-0.1660	0.8998	0.1361	6.61
2	Mountain	59	943	29	31	0.5995	-0.0487	0.6482	0.1986	3.26
		1062		291	311					

Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	869	13910	397	199	-0.1164	0.4090	-0.5254	0.0989	-5.31
2	Piedmont	134	2142	106	81	0.4559	-0.0851	0.5410	0.1108	4.88
2	Mountain	59	943	40	31	0.2942	-0.0201	0.3143	0.1676	1.87
		1062		543	311					

Non Site 250 Grid Landform										
CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	869	13910	13331	199	0.1031	-0.3735	0.4765	0.0843	5.65
2	Piedmont	134	2142	2009	81	-0.3160	0.0540	-0.3700	0.0982	-3.77
2	Mountain	59	943	874	31	-0.4944	0.0371	-0.5315	0.1308	-4.06
		1062		16214	311					

Chi-Square

Salt Lake Vegetation			
Points on 250m grid			
	Site	Not Site	ROW
Juniper/Pinyon	97	1863	1960.00
Other veg	446	14351	14797.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
Juniper/Pinyon	63.51	1896.49	
Other veg	479.49	14317.51	
Cell chi values			
	Site	Not Site	
Juniper/Pinyon	33.49	-33.49	
Other veg	-33.49	33.49	
Chi-squares			
	Site	Not Site	
Juniper/Pinyon	17.66	0.59	
Other veg	2.34	0.08	
20.66	Chi Square		
Cell std. residuals			
	Site	Not Site	
Juniper/Pinyon	4.20	-0.77	
Other veg	-1.53	0.28	
Cell variance			
	Site	Not Site	
Juniper/Pinyon	0.85	0.03	
Other veg	0.11	0.00	
Adj. std. residuals			
	Site	Not Site	
Juniper/Pinyon	4.55	-4.55	
Other veg	-4.55	4.55	
			0.00

Salt Lake Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
>2000	253	6541	6794.00
200-2000	290	9673	9963.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
>2000	220.16	6573.84	
200-2000	322.84	9640.16	
Cell chi values			
	Site	Not Site	
>2000	32.84	-32.84	
200-2000	-32.84	32.84	
Chi-squares			
	Site	Not Site	
>2000	4.90	0.16	
200-2000	3.34	0.11	
8.62	Chi Square		
Cell std. residuals			
	Site	Not Site	
>2000	2.21	-0.41	
200-2000	-1.83	0.33	
Cell variance			
	Site	Not Site	
>2000	0.85	0.03	
200-2000	0.11	0.00	
Adj. std. residuals			
	Site	Not Site	
>2000	2.39	-2.39	
200-2000	-5.43	5.43	
			0.00

Salt Lake Wetland			
Points on 250m grid			
	Site	Not Site	ROW
0-1000	164	3031	3195.00
>1000	379	13183	13562.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
0-1000	103.53	3091.47	
>1000	439.47	13122.53	
Cell chi values			
	Site	Not Site	
0-1000	60.47	-60.47	
>1000	-60.47	60.47	
Chi-squares			
	Site	Not Site	
0-1000	35.32	1.18	
>1000	8.32	0.28	
45.10	Chi Square		
Cell std. residuals			
	Site	Not Site	
0-1000	5.94	-1.09	
>1000	-2.88	0.53	
Cell variance			
	Site	Not Site	
0-1000	0.85	0.03	
>1000	0.11	0.00	
Adj. std. residuals			
	Site	Not Site	
0-1000	6.43	-6.43	
>1000	-8.57	8.57	
			0.00

Salt Lake Slope			
Points on 250m grid			
	Site	Not Site	ROW
5-15 degree	33	740	773.00
Not 5-15 degree	510	15474	15984.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
5-15 degree	25.05	747.95	
Not 5-15 degree	517.95	15466.05	
Cell chi values			
	Site	Not Site	
5-15 degree	7.95	-7.95	
Not 5-15 degree	-7.95	7.95	
Chi-squares			
	Site	Not Site	
5-15 degree	2.52	0.08	
Not 5-15 degree	0.12	0.00	
2.73	Chi Square		
Cell std. residuals			
	Site	Not Site	
5-15 degree	1.59	-0.29	
Not 5-15 degree	-0.35	0.06	
Cell variance			
	Site	Not Site	
5-15 degree	0.85	0.03	
Not 5-15 degree	0.11	0.00	
Adj. std. residuals			
	Site	Not Site	
5-15 degree	1.72	-1.72	
Not 5-15 degree	-1.04	1.04	
			0.00

Salt Lake Landform			
Points on 250m grid			
	Site	Not Site	ROW
Piedmont	106	2009	2115.00
Not Piedmont	437	14205	14642.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
Piedmont	68.54	2046.46	
Not Piedmont	474.46	14167.54	
Cell chi values			
	Site	Not Site	
Piedmont	37.46	-37.46	
Not Piedmont	-37.46	37.46	
Chi-squares			
	Site	Not Site	
Piedmont	20.46	0.69	
Not Piedmont	2.96	0.10	
24.22	Chi Square		
Cell std. residuals			
	Site	Not Site	
Piedmont	4.53	-0.83	
Not Piedmont	-1.72	0.31	
Cell variance			
	Site	Not Site	
Piedmont	0.85	0.03	
Not Piedmont	0.11	0.00	
Adj. std. residuals			
	Site	Not Site	
Piedmont	4.90	-4.90	
Not Piedmont	-5.11	5.11	
			0.00

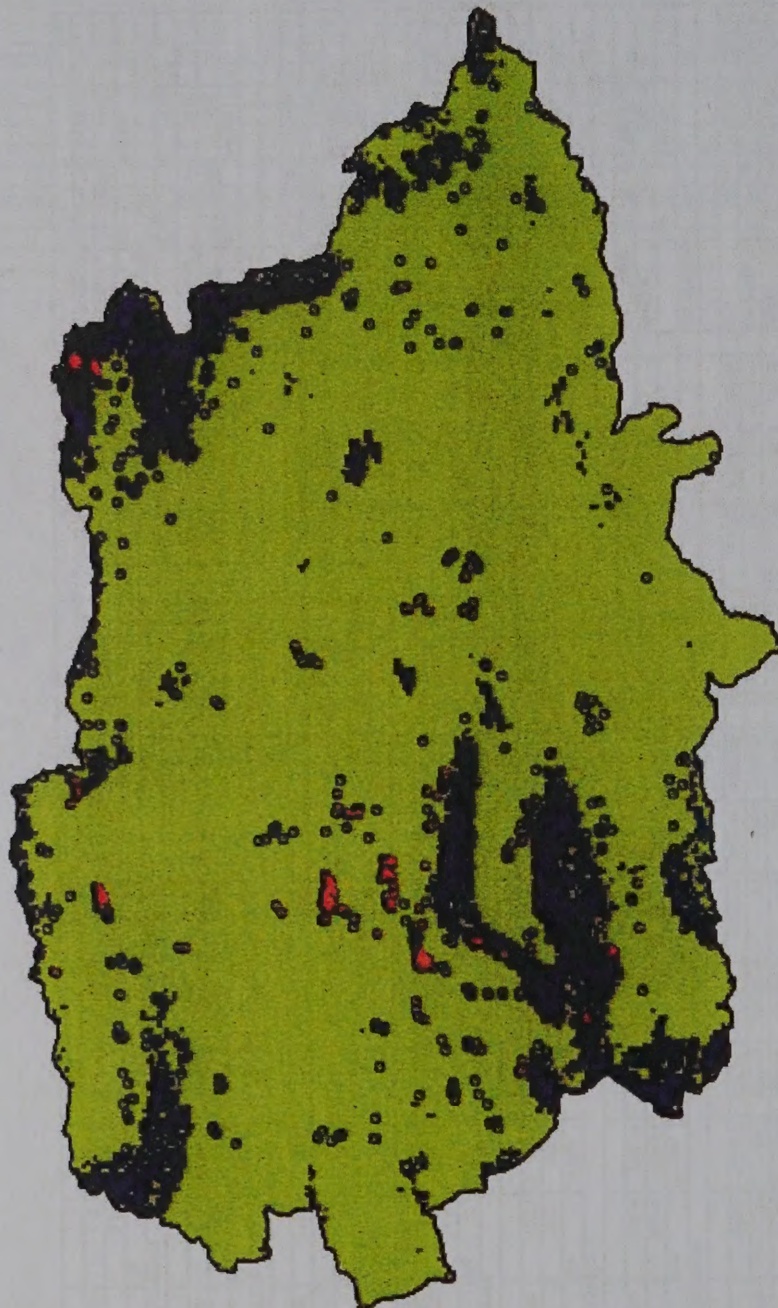


Figure 5.53 Great Salt Lake Analytic Unit Predictive Pattern - Vegetation

Salt Lake Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Vegetation
Outside
Inside
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

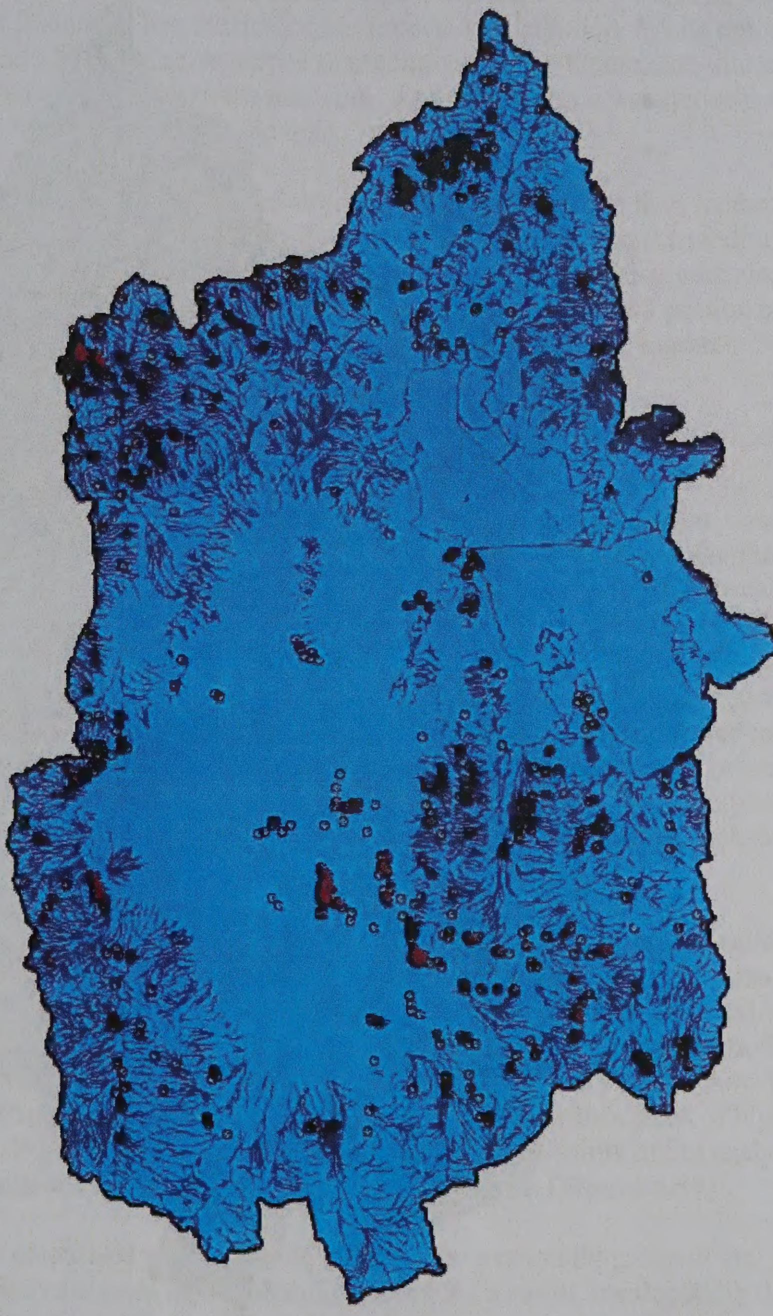


Figure 5.54 Great Salt Lake Analytic Unit Predictive Pattern - Streams and Springs

Figure 5.55 Great Salt Lake Analytic Unit Predictive Pattern - Potential Wetland

Most of the sites within the analytic unit lie on slopes between 0 and 5 degrees, but proportionally, that frequency lies outside of the expected distribution. While one would be inclined to accept the 15 to 30 degree slopes as predictive for the theme, non-site analysis suggests that it is likewise predictive for non-sites. As a result, slope was not selected as a predictive theme in the Salt Lake analytic unit.

Landform as an evidential theme provides stronger relational contrasts than incremental slope. While most of the sites occur within flats along the valley floors, the piedmont is consistently characterized by higher than expected site frequencies. Chi-square also confirms a non-random distribution. The piedmont as a landform class subsumes a portion of the slopes within a 5 to 30 degrees range and was selected as a predictive evidential class. **(Figure 5.56)**

Prehistoric Predictive Response

After identifying evidential theme classes that lie inside the predictive pattern, a response theme was calculated in order to compile a probability map based upon the likelihood of encountering a site within the aggregated evidential themes. **(Figure 5.57)** Normalized posterior probabilities were used as a means to evaluate tabular results. Observed breaks are apparent at posterior probabilities of 0.016 and 0.004. (Table 5.27) **(Figure 5.58)** Highest probabilities for encountering sites occur in areas within 1000 meters of potential wetlands and on piedmont slopes, or a within a combination of proximity to potential wetland, piedmont slopes, and juniper/pinyon vegetation zones. Probabilities decrease in areas characterized by the presence of a predictive single evidential theme. When no predictive classes are present, posterior probabilities fall below the0 .005 critical prior probability value, and predictive probabilities are lowest.

Results of the probability model were analyzed in a spatial context in order to validate model results. (Table 5.28) Extent of the sensitivity areas, those within both the entire analytic unit and inventoried portions of the analytic unit, were contrasted with actual areal extent of the sites within each sensitivity zone. Highest ratios of site area to sensitivity area should fall within zones of highest probability if the model is accurate. Summary tables show that the areal density of all sites and inventoried sites are indeed highest within areas of high to medium sensitivity. While areas of low sensitivity comprise two-thirds of the analytic unit they consistently maintain the lowest values of site to total area. **(Figure 5.59)**

The response theme calculated with *Spatial Data Modeler* accurately grouped the intersection of predictive classes into probability zones. As a result, recalculating the response using *Spatial Analyst®* produce similar results. Variation in probability and site areas change less than 0.5%.

Historic Evidential Themes

Two hundred three historic sites are reported within the Great Salt Lake analytic unit. Within the 1062 square kilometers subset of inventories greater than 640 acres in extent, 61 sites are considered for analysis. (Table 5.25) **(Figure 5.60)** Distance to existing roads and water

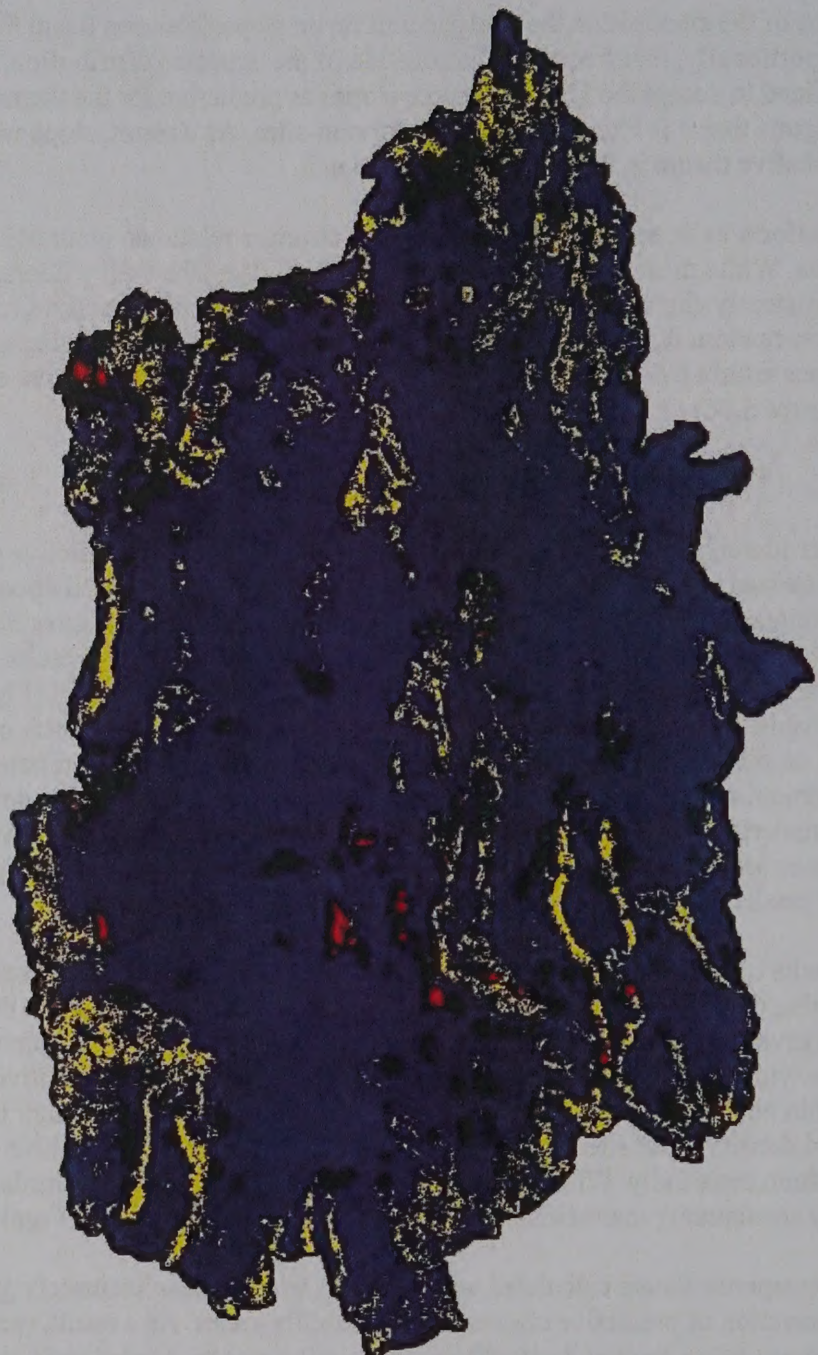


Figure 5.56 Great Salt Lake Analytic Unit Predictive Pattern - Landform

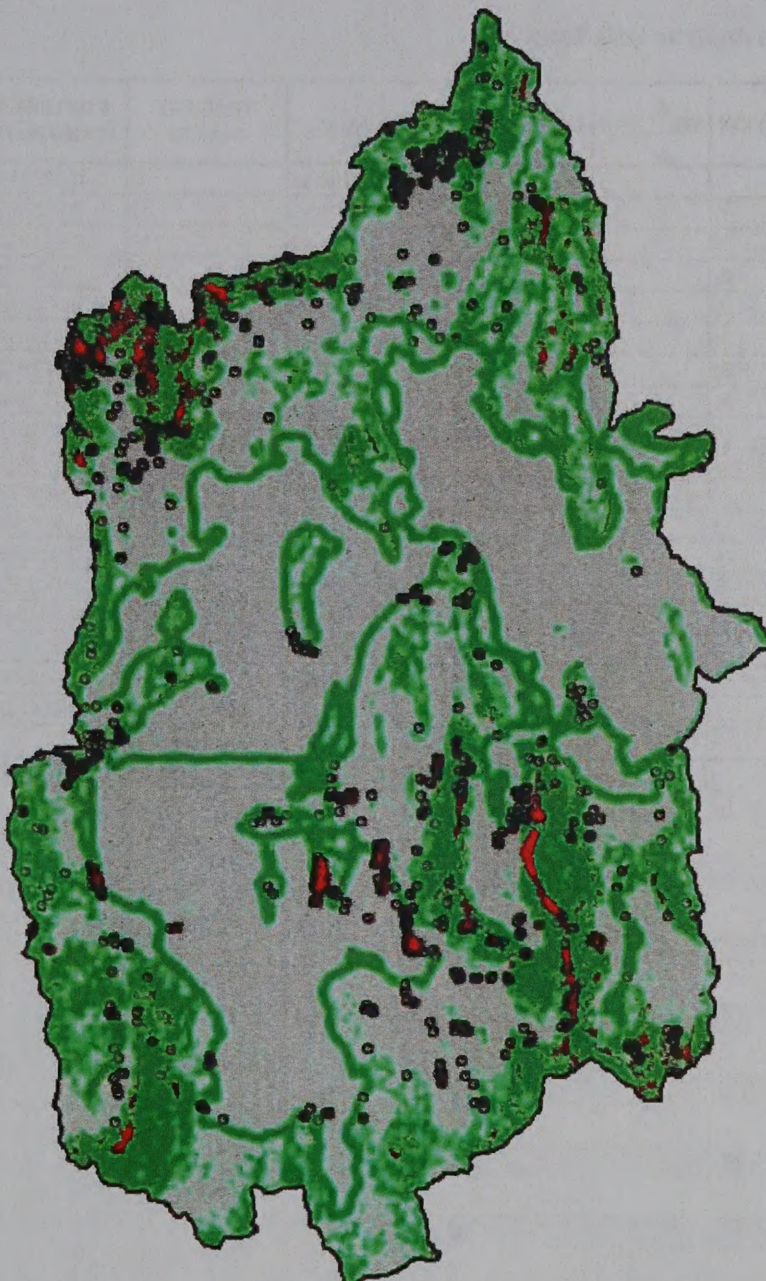


Figure 5.57 Great Salt Lake Analytic Unit Observed Probability - Prehistoric

Salt Lake Analytic Unit
Prehistoric Sites (Inventoried)
Prehistoric Sites
Probability
Low
Medium
High
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Table 5.27
Great Salt Lake Analytic Unit Response

VALUE	VEGETATION	WETLAND	LANDFORM	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
17	1	1	1	2260298.34	0	0.03738461	0.03712282	High
18	1	-99	1	70005.95	0	0.02552116	0.02534244	
6	1	0	1	1214583044.60	110	0.02383225	0.02366536	
15	-99	1	1	417056.70	0	0.01911288	0.01897904	
11	0	1	1	371325684.54	11	0.01661827	0.01650190	
16	1	1	0	10952951.48	0	0.01346912	0.01337480	Med
9	-99	-99	1	196612.44	0	0.01296957	0.01287875	
4	-99	0	1	27809489.44	1	0.01210097	0.01201623	
8	0	-99	1	116180.08	0	0.01126757	0.01118867	
3	0	0	1	3819088705.73	160	0.01051174	0.01043813	
13	1	-99	0	259170.95	0	0.00912297	0.00905908	
5	1	0	0	3692077812.68	112	0.00850977	0.00845018	
14	-99	1	0	18969376.97	0	0.00680348	0.00675584	
10	0	1	0	4734822327.36	162	0.00590581	0.00586445	
12	-99	-99	0	582389.89	0	0.00459814	0.00456594	Low
2	-99	0	0	88086842.66	2	0.00428776	0.00425773	
7	0	-99	0	340348.05	0	0.00399028	0.00396234	
1	0	0	0	27664096771.18	390	0.00372078	0.00369472	
					Prior Probability	0.00500000		

Figure 5.58 Great Salt Lake Analytic Unit Observed Breaks

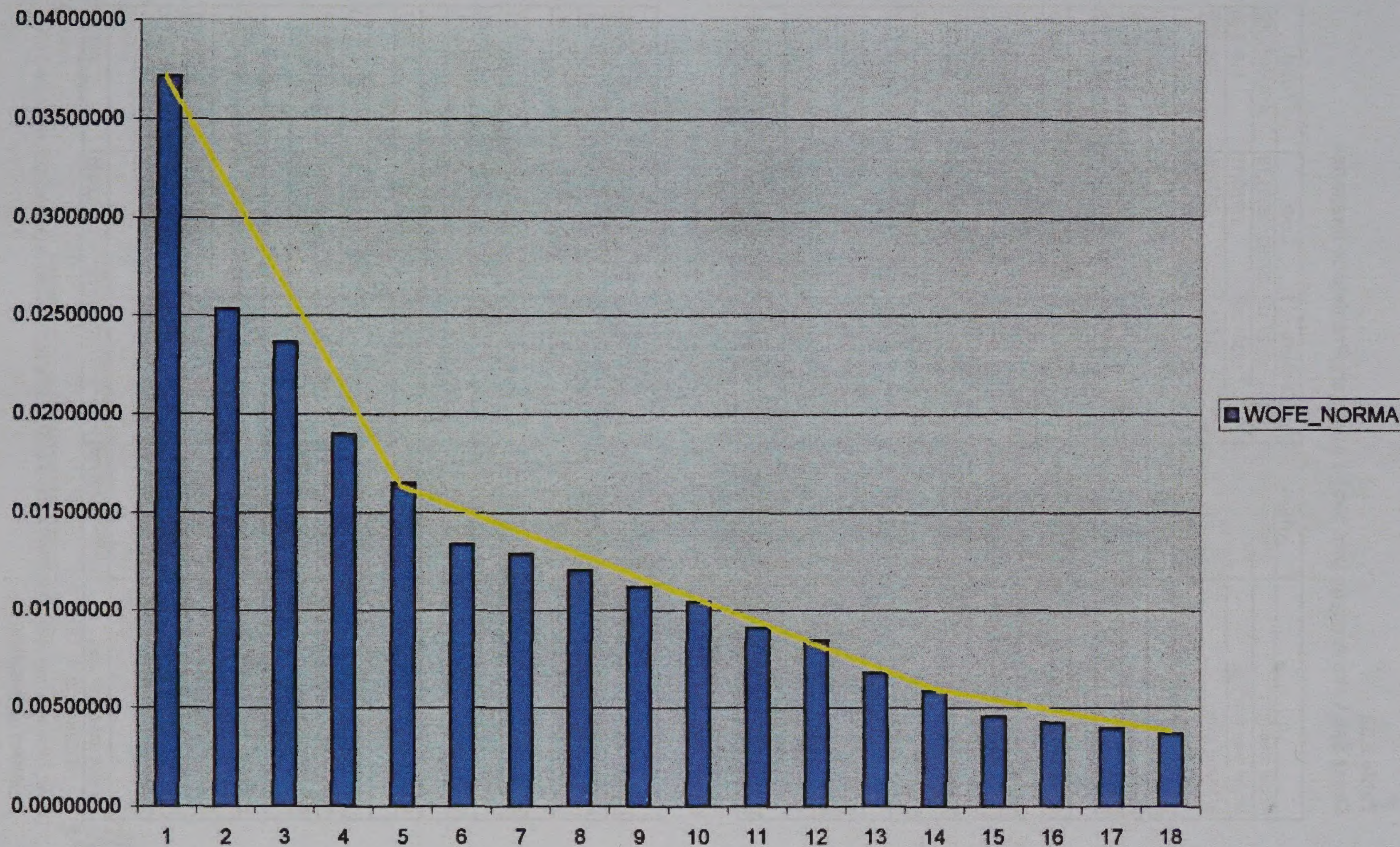


Table 5.28
Great Salt Lake Analytic Unit Model Summary Prehistoric Response

	High	Medium	Low	Total
Model area (m^2)	1588656090.13	12304292627.13	27753106351.78	41646055069
Model area (km^2)	1588.66	12304.29	27753.11	41646.06
% Model area	3.81%	29.54%	66.64%	100.00%
All sites area (m^2)	3272428.00	11972824.00	12531640.00	27776892.00
All sites area (km^2)	3.27	11.97	12.53	27.78
% Site area	11.78%	43.10%	45.12%	100.00%
All Site area / model area	**0.0021**	**0.0010**	**0.0005**	**0.0007**
Inventory area (m^2)	47948860.00	363288416.00	650945792.00	1062183068.00
Inventory area (km^2)	47.95	363.29	650.95	1062.18
% Inventory area	4.51%	34.20%	61.28%	100.00%
% Model area inventoried	**3.02%**	**2.95%**	**2.35%**	**2.55%**
Inventory sites area (m^2)	621116.56	3849582.25	2648310.00	7119008.81
Inventory sites area (km^2)	0.62	3.85	2.65	7.12
% Inventory site area	8.72%	54.07%	37.20%	100.00%
Inv site area / inv area	**0.0130**	**0.0106**	**0.0041**	**0.0067**

Great Salt Lake Analytic Unit Model Summary Prehistoric Composite

	High (3-2)	Medium (1)	Low (0)	Total
Model area (m^2)	1599121920.00	12245988352.00	27664097280.00	41509207552.00
Model area (km^2)	1599.12	12245.99	27664.10	41509.21
% Model area	3.85%	29.50%	66.65%	100.00%
All sites area (m^2)	3270916.00	11951653.00	12302428.00	27524997.00
All sites area (km^2)	3.27	11.95	12.30	27.52
% Site area	11.88%	43.42%	44.70%	100.00%
All site area / model area	**0.0020**	**0.0010**	**0.0004**	**0.0007**
Inventory area (m^2)	47983864.00	362866880.00	650192896.00	1061043640.00
Inventory area (km^2)	47.98	362.87	650.19	1061.04
% Inventory area	4.52%	34.20%	61.28%	100.00%
% Model area inventoried	**3.00%**	**2.96%**	**2.35%**	**2.56%**
Inventory sites area (m^2)	621116.56	3849582.25	2648310.00	7119008.81
Inventory sites area (km^2)	0.62	3.85	2.65	7.12
% Inventory site area	8.72%	54.07%	37.20%	100.00%
Inv site area / inv area	**0.0129**	**0.0106**	**0.0041**	**0.0067**

Note: Total area may vary between response and composite analysis due to grid variation within the vegetation evidential theme.

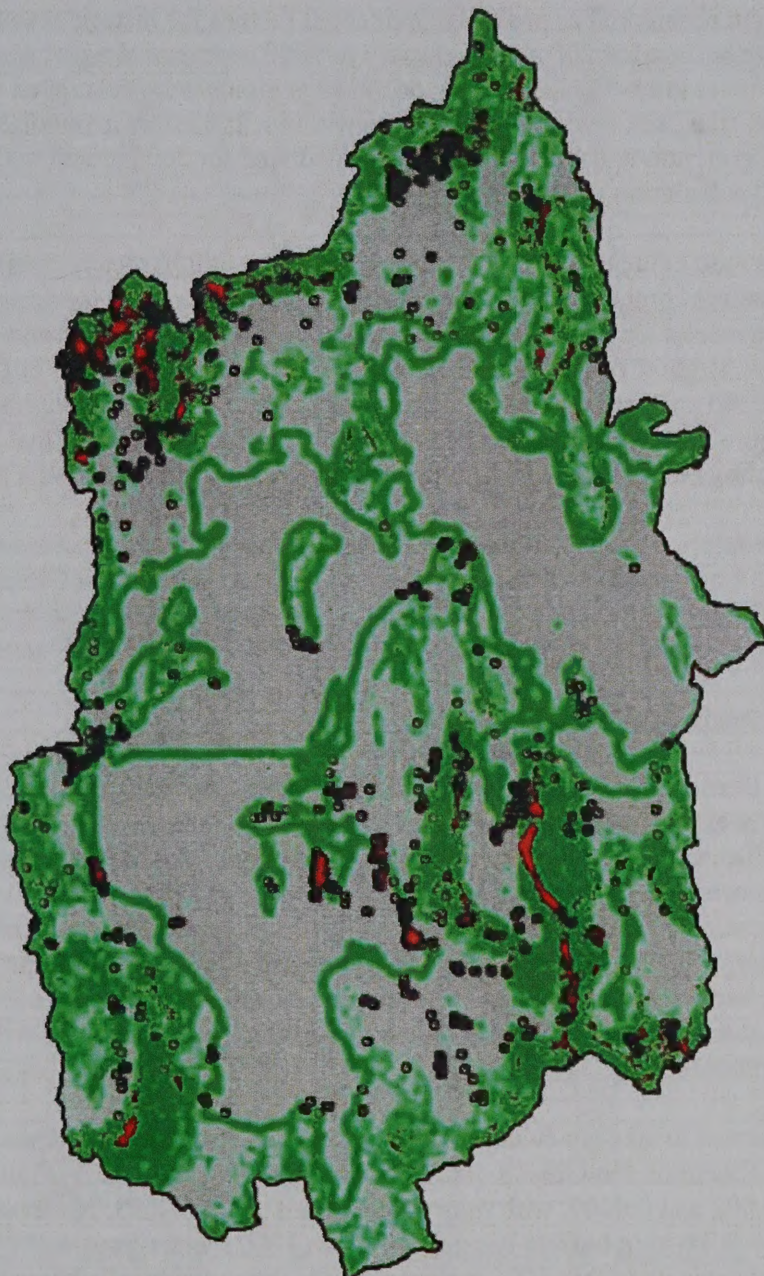
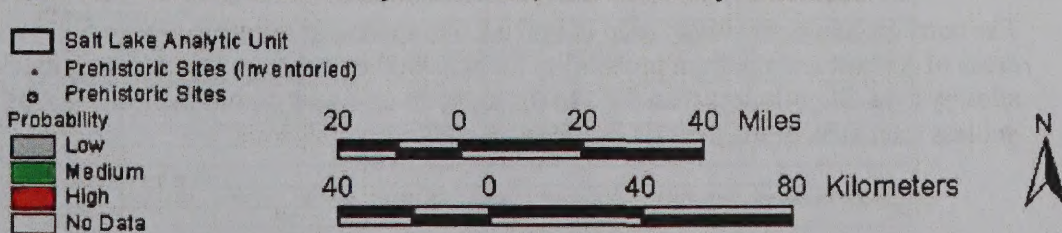


Figure 5.59 Great Salt Lake Analytic Unit Composite Probability - Prehistoric



sources were considered as predictive evidential themes for historic resources. (Table 5.29) Roads were buffered at 200 meter intervals to 1000 meters, and water sources at 200, 400 and 1000 meter intervals. Like prehistoric sites, weights were calculated for using all sites, inventoried sites, and inventoried site areas within a 250 meter inventoried grid. Within the 250 meter grid, non-site weights were also calculated for comparison with weighted site results and calculation of chi-square.

Within the road evidential theme, a buffered distance of 200 meters consistently revealed the highest positive contrast, with a corresponding negative contrast for non-sites. (Figure 5.61) Chi-square results for this class fail to meet the desired threshold for non-random distribution. Highest contrasts are reflected within the 600-800 meter buffer for site areas within the 250 meter grid, but a high positive contrast in non-site weights within the same class suggests that the occurrence of non-sites is highly probable for that buffered area. With the conflicting results, no class within roads was clearly predictive for a positive contrast.

Within inventoried areas, contrasts for distance to water showed increasingly high probability as distance from the water source increased from 0 to 1000 meters. Chi-square results show a correspondingly positive relationship. Negative contrasts for non-site areas corroborate the probability of encountering sites within an ascending radius of water sources. (Figure 5.62)

Historic Predictive Response

Response themes cannot be built without a minimum of at least two evidential themes. The water buffer alone could have been used as a predictive mask, but further analysis of the weights tables showed a good correlation for sites not occurring more than 1000 meters from roads, or more than 1000 meters from water sources. The highest negative contrasts for each theme was selected as "inside" the pattern and used to calculate a response theme. Since the resulting response table calculates weights and probabilities for combined classes, the only difference between selecting positive or negative contrasts is that the intersection of evidential theme classes appears at the bottom of the table, associated with the lowest posterior probabilities.

Three observed breaks are evident within posterior probabilities generated for historic evidential themes in the Great Salt Lake analytic unit. (Table 5.30) (Figure 5.63) Breaks occur at 0.002 and 0.0007, with prior probabilities set at 0.0003. No areas within high probability fall within buffers lying further than 1000 meters from water or roads. Moderate probability areas lie within 1000 meters of roads, but occasionally more than 1000 meters from water, and low probability zones always occur more than 1000 meters distant from roads, or more than 1000 meters from roads and water.

The corresponding sensitivity map (Figure 5.64) and summary table (Table 5.31) shows that areas of highest and medium probability include well over 80% of all sites and inventoried sites by area. Slightly less than 50% of the analytic unit falls within the low probability area, yet less than 10% of the historic site areas occur within that zone.

Table 5.29
Great Salt Lake Analytic Unit Historic Evidential Theme Weights/Chi-Square

Theme Weight

ALL SITES

Roads

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	6637	26550	122	131	1.3969	-0.8546	2.2515	0.1515	14.86
400	200-400m	4922	19690	23	23	0.0239	-0.0032	0.0272	0.2225	0.12
600	400-600m	3846	15385	10	11	-0.5629	0.0429	-0.6057	0.3250	-1.86
800	600-800m	3069	12275	9	9	-0.4423	0.0281	-0.4704	0.3416	-1.38
1000	800-1000m	2445	9778	8	9	-0.3326	0.0175	-0.3501	0.3614	-0.97
9999	>1000m	20726	82905	18	20	-1.6598	0.5899	-2.2497	0.2478	-9.08
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41546		190	203					

Inventoried Roads

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	210	840	40	43	1.3018	-0.9980	2.2997	0.2922	7.87
400	200-400m	136	546	4	4	-0.6103	0.0656	-0.6759	0.5206	-1.30
600	400-600m	105	419	2	2	-1.0410	0.0689	-1.1100	0.7217	-1.54
800	600-800m	79	315	3	3	-0.3455	0.0232	-0.3687	0.5961	-0.62
1000	800-1000m	60	239	2	3	-0.4755	0.0224	-0.4979	0.7230	-0.69
9999	>1000m	473	1891	6	6	-1.4522	0.4861	-1.9382	0.4327	-4.48
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		57	61					

Site 250 Grid Roads

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	210	3361	116	43	0.0798	-0.0206	0.1004	0.1065	0.94
400	200-400m	136	2182	55	4	-0.2441	0.0317	-0.2758	0.1441	-1.91
600	400-600m	105	1674	58	2	0.0837	-0.0096	0.0933	0.1414	0.66
800	600-800m	79	1259	58	3	0.3809	-0.0372	0.4181	0.1421	2.94
1000	800-1000m	60	954	37	3	0.2004	-0.0132	0.2136	0.1737	1.23
9999	>1000m	473	7564	219	6	-0.1017	0.0751	-0.1767	0.0889	-1.99
-99	No data	0	0	0	0	0	0.0000	0.0000	0.0000	0.00
	Total	1062		543	61					

Non Site 250 Grid Roads

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	210	3361	3178	43	-0.1790	0.0490	-0.2280	0.0868	-2.63
400	200-400m	136	2182	2068	4	-0.1368	0.0217	-0.1585	0.1040	-1.52
600	400-600m	105	1674	1575	2	-0.2678	0.0336	-0.3014	0.1107	-2.72
800	600-800m	79	1259	1225	3	0.5611	-0.0345	0.5956	0.1787	3.33
1000	800-1000m	60	954	910	3	-0.0147	0.0009	-0.0155	0.1581	-0.10
9999	>1000m	473	7564	7258	6	0.1320	-0.0955	0.2275	0.0750	3.03
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	1062		16214	61					

Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	7818	31273	58	58	0.4869	-0.1565	0.6433	0.1577	4.08
400	200-400m	6308	25233	25	27	-0.1410	0.0232	-0.1642	0.2147	-0.76
1000	400-1000m	10296	41184	59	65	0.2282	-0.0879	0.3162	0.1569	2.02
9999	>1000m	17223	68893	48	53	-0.4933	0.2428	-0.7361	0.1670	-4.41
-99	No Data	0	1	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	41646		190	203					

Inventoried Streams and Springs

CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	689	13	13	0.3463	-0.0829	0.4293	0.3185	1.35
400	200-400m	128	514	12	13	0.5648	-0.1089	0.6737	0.3284	2.05
1000	400-1000m	209	836	16	18	0.3605	-0.1116	0.4721	0.2973	1.59
9999	>1000m	552	2209	16	17	-0.6228	0.4113	-1.0341	0.2964	-3.49
	Total	1062		57	61					

Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	2757	73	13	0.5068	-0.1349	0.6417	0.1383	4.64
400	200-400m	128	2055	61	13	0.6244	-0.1249	0.7493	0.1472	5.09
1000	400-1000m	209	3346	100	18	0.6313	-0.2382	0.8695	0.1270	6.85
9999	>1000m	552	8837	40	17	-1.2821	0.5890	-1.8711	0.1718	-10.89
	Total	1062		274	61					

Non Site 250 Grid Streams and Springs

CLASS		Area sq.km	250m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	172	2757	2634	13	-0.4056	0.1000	-0.5055	0.1057	-4.78
400	200-400m	128	2055	1942	13	-0.6255	0.1234	-0.7489	0.1094	-6.85
1000	400-1000m	209	3346	3208	18	-0.3257	0.0977	-0.4234	0.1015	-4.17
9999	>1000m	552	8837	8699	17	0.6684	-0.4349	1.1033	0.1007	10.96
	Total	1062		16483	61					

Chi-square

Salt Lake Roads			
Points on 250m grid			
	Site	Not Site	ROW
600-800	58	1225	1283.00
0-600,>800	485	14989	15474.00
COL	543.00	16214.00	16757.00
Expected values			
	Site	Not Site	
600-800	41.57	1241.43	
0-600,>800	501.43	14972.57	
Cell chi values			
	Site	Not Site	
600-800	16.43	-16.43	
0-600,>800	-16.43	16.43	
Chi-squares			
	Site	Not Site	
600-800	6.49	0.22	
0-600,>800	0.54	0.02	
7.28	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
600-800	2.55	-0.47	
0-600,>800	-0.73	0.13	
Cell variance			
	Site	Not Site	
600-800	0.89	0.03	
0-600,>800	0.07	0.00	
Adj. std. residuals			
	Site	Not Site	
600-800	2.69	-2.69	
0-600,>800	-2.69	2.69	
			0.00

Salt Lake Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
0-200	73	2634	2707.00
>200	201	13849	14050.00
COL	274.00	16483.00	16757.00
Expected values			
	Site	Not Site	
0-200	44.26	2662.74	
>200	229.74	13820.26	
Cell chi values			
	Site	Not Site	
0-200	28.74	-28.74	
>200	-28.74	28.74	
Chi-squares			
	Site	Not Site	
0-200	18.66	0.31	
>200	3.59	0.06	
22.62	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
0-200	4.32	-0.56	
>200	-1.90	0.24	
Cell variance			
	Site	Not Site	
0-200	0.91	0.02	
>200	0.08	0.00	
Adj. std. residuals			
	Site	Not Site	
0-200	4.53	-4.53	
>200	-6.91	6.91	
			0.00

Salt Lake Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
200-400	61	1942	2003.00
0-200,>400	213	14541	14754.00
COL	274.00	16483.00	16757.00
Expected values			
	Site	Not Site	
200-400	32.75	1970.25	
0-200,>400	241.25	14512.75	
Cell chi values			
	Site	Not Site	
200-400	28.25	-28.25	
0-200,>400	-28.25	28.25	
Chi-squares			
	Site	Not Site	
200-400	24.38	0.41	
0-200,>400	3.31	0.05	
28.13	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
200-400	4.94	-0.64	
0-200,>400	-1.82	0.23	
Cell variance			
	Site	Not Site	
200-400	0.91	0.02	
0-200,>400	0.08	0.00	
Adj. std. residuals			
	Site	Not Site	
200-400	5.18	-5.18	
0-200,>400	-6.63	6.63	
			0.00

Salt Lake Streams and Springs			
Points on 250m grid			
	Site	Not Site	ROW
400-1000	100	3208	3308.00
0-400,>1000	174	13275	13449.00
COL	274.00	16483.00	16757.00
Expected values			
	Site	Not Site	
400-1000	54.09	3253.91	
0-400,>1000	219.91	13229.09	
Cell chi values			
	Site	Not Site	
400-1000	45.91	-45.91	
0-400,>1000	-45.91	45.91	
Chi-squares			
	Site	Not Site	
400-1000	38.97	0.65	
0-400,>1000	9.58	0.16	
49.36	**Chi Square**		
Cell std. residuals			
	Site	Not Site	
400-1000	6.24	-0.80	
0-400,>1000	-3.10	0.40	
Cell variance			
	Site	Not Site	
400-1000	0.91	0.02	
0-400,>1000	0.08	0.00	
Adj. std. residuals			
	Site	Not Site	
400-1000	6.55	-6.55	
0-400,>1000	-11.28	11.28	
			0.00

Figure 5.60 Great Salt Lake Analytic Unit - Inventories and Historic Sites

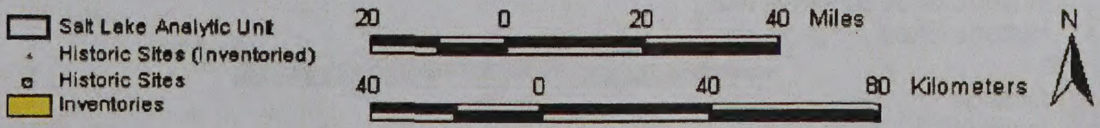


Figure 5.61 Great Salt Lake Analytic Unit Predictive Pattern - Roads

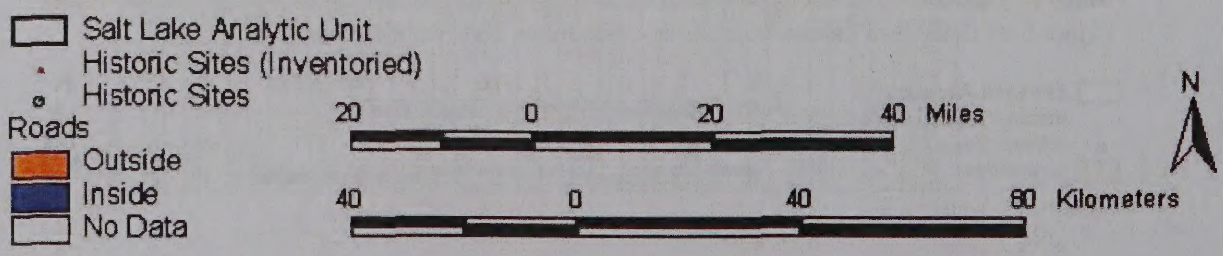


Figure 5.62 Great Salt Lake Analytic Unit Predictive Pattern - Water

Salt Lake Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Water
Outside
Inside
No Data

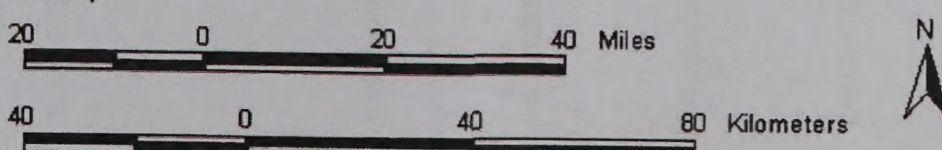
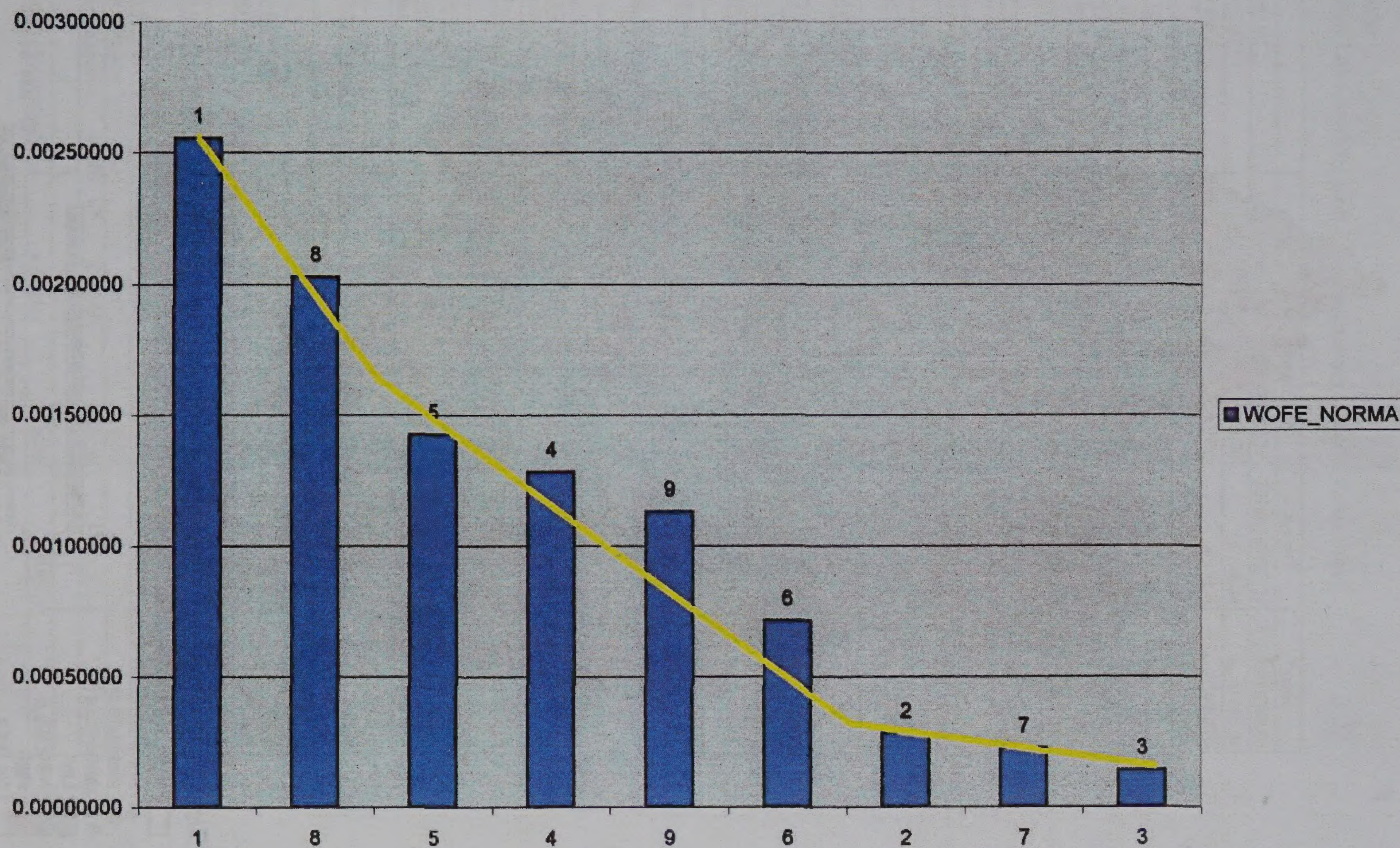
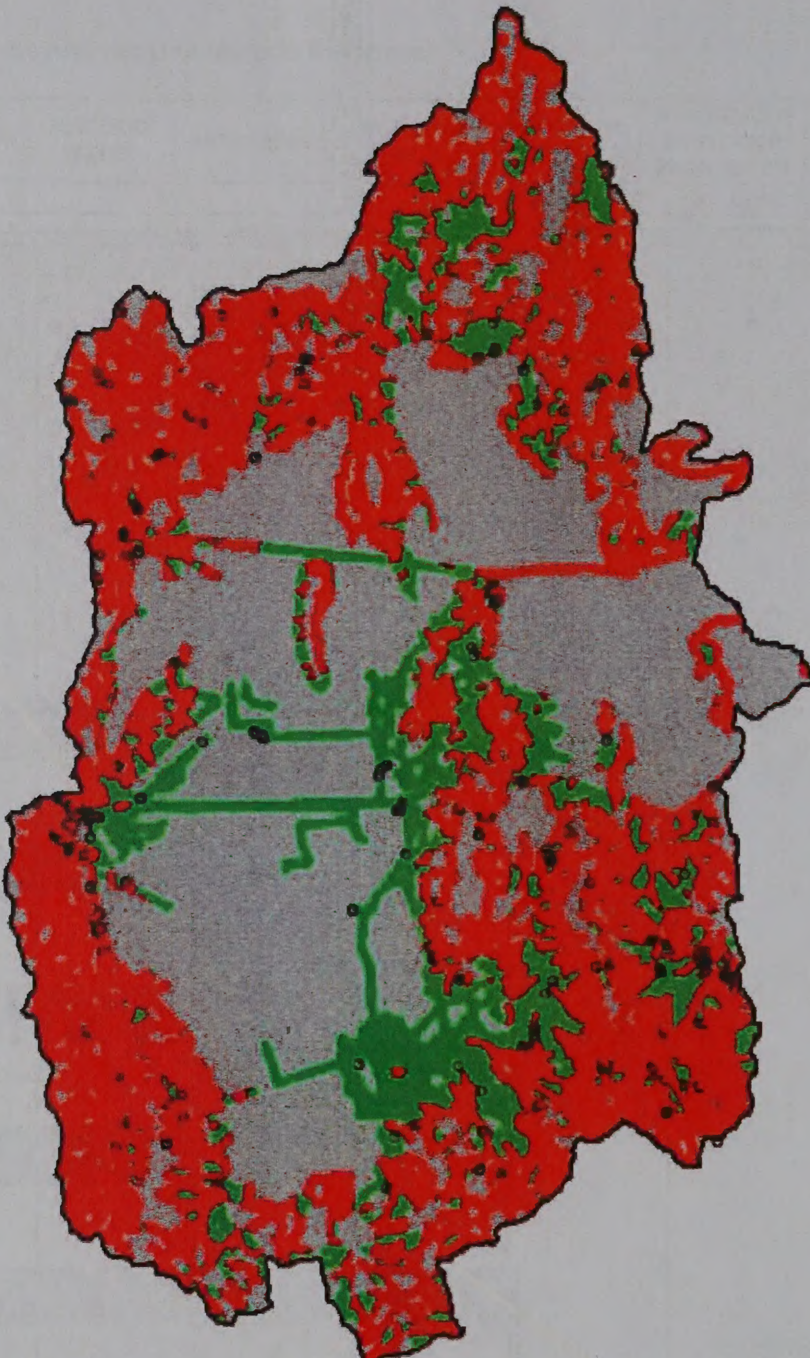


Table 5.30
Great Salt Lake Analytic Unit Historic Response

VALUE	ROADS	HISTORIC WATER	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
1	0	0		140	0.00275486	0.00255509	High
8	0	-99	65537.48	0	0.00218701	0.00202842	
5	-99	0	21597.58	0	0.00153540	0.00142406	Med
4	0	1		43	0.00138119	0.00128103	
9	-99	-99	744.74	0	0.00121860	0.00113023	
6	-99	1	6702.70	0	0.00076932	0.00071353	
2	1	0		10	0.00030401	0.00028196	Low
7	1	-99	141501.38	0	0.00024123	0.00022374	
3	1	1		10	0.00015224	0.00014120	
				Prior Probability	0.00030000		

Figure 5.63 Great Salt Lake Analytic Unit Historic Response





Figures 5.64 Great Salt Lake Analytic Unit Observed Probability - Historic

Salt Lake Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Probability
Low
Medium
High
No Data

20 0 20 40 Miles

40 0 40 80 Kilometers

N

Table 5.31
Great Salt Lake Analytic Unit Model Summary Historic Response

	High	Medium	Low	Total
Model area (m^2)	15518336331.13	5401380212.77	20726338525.13	41646055069.03
Model area (km^2)	15518.34	5401.38	20726.34	41646.06
% Model area	37.26%	12.97%	49.77%	100.00%
All sites area (m^2)	8448377.00	2772682.25	948804.00	12169863.25
All sites area (km^2)	8.45	2.77	0.95	12.17
% Site area	69.42%	22.78%	7.80%	100.00%
All site area / model area	**0.0005**	**0.0005**	**0.0000**	**0.0003**
Inventory Area (m^2)	377139904.00	212271424.00	472771744.00	1062183072.00
Inventory Area (km^2)	377.14	212.27	472.77	1062.18
% Inventory Area	35.51%	19.98%	44.51%	100.00%
% Model area inventoried	**2.43%**	**3.93%**	**2.28%**	**2.55%**
Inventory sites area (m^2)	5553557.00	452059.66	266618.38	6272235.03
Inventory sites area (km^2)	5.55	0.45	0.27	6.27
% Inventory site area	88.54%	7.21%	4.25%	100.00%
Inv site area / inv area	**0.0147**	**0.0021**	**0.0006**	**0.0059**

Great Salt Lake Analytic Unit Model Summary Historic Composite

	High (2)	Medium (1)	Low (0)	Total
Model area (m^2)	15518270464.00	14305559552.00	11821988864.00	41645818880.00
Model area (km^2)	15518.27	14305.56	11821.99	41645.82
% Model area	37.26%	34.35%	28.39%	100.00%
All sites area (m^2)	8448377.00	3560621.50	160864.72	12169863.22
All sites area (km^2)	8.45	3.56	0.16	12.17
% site area	69.42%	29.26%	1.32%	100.00%
All site area / model area	**0.0005**	**0.0002**	**0.0000**	**0.0003**
Inventory area (m^2)	377139904.00	344971424.00	340071008.00	1062182336.00
Inventory area (km^2)	377.14	344.97	340.07	1062.18
% Inventory area	35.51%	32.48%	32.02%	100.00%
% Model area inventoried	**2.43%**	**2.41%**	**2.88%**	**2.55%**
Inventory sites area (m^2)	5553557.00	685164.56	33513.48	6272235.05
Inventory sites area (km^2)	5.55	0.69	0.03	6.27
% Inventory site area	88.54%	10.92%	0.53%	100.00%
Inv site area / inv area	**0.0147**	**0.0020**	**0.0001**	**0.0059**

Recalculating the historic probability by intersection of predictive classes redefines medium and low probability zones. The medium probability area is expanded to 34% of the analytic unit with 29% of all sites present, while the low probability zone decreased to 28% of the analytic unit and includes slightly more than 1% of all sites. Within inventoried areas, less than 1% of the sites fall within the low probability zone. (Figure 5.65)

UPPER SNAKE ANALYTIC UNIT

Analytic Unit Description

The Upper Snake sub-region covers approximately 3.0 million acres (4801 mi^2)/1.2 million hectares (12,435 km^2) within southern Idaho, northeastern Nevada, and northwestern Utah (Figure 5.66) or 15% of the GBRI study area. Three hydrographic units, Salmon Falls, Goose, and Raft comprise the analytical portion of the sub-region. (Table 5.32) All three drain in a northeasterly direction towards the Snake River. Complex, dendritic drainage patterns dominate the Upper Snake sub-region.

Salmon Falls

The Salmon Falls hydrographic unit lies in the westernmost portion of the Upper Snake analytic unit. Salmon Falls Creek and its tributaries is the dominant hydrologic feature of the hydrographic unit. (Figure 5.67) Elevations range from 2631 meters at Ellen D Mountain, and 2410 meters at Middle Stack Mountain near Contact, Nevada, in the southern portion of the hydrographic unit to 900 meters at the confluence of Salmon Falls Creek and the Snake River in the northern portion of the hydrographic unit. Major physiographic feature include the O'Neil and Shoshone Basins, Antelope Pocket and Browns Bench, a major obsidian source, all within the southern half of the unit. Vegetation is primarily sagebrush with some pinyon/juniper woodland. Topography becomes more subdued progressing northward through the Hydrographic unit. Higher mountains give way to low ridges and dissected basalt plateaus.

Goose

The Goose hydrographic unit lies in the central portion of the Upper Snake analytic unit, covering portions of Idaho, Nevada, and Utah. (Figure 5.68) Goose Creek and its tributaries dominate the hydrology of this hydrographic unit. Like Salmon Falls Creek, it drains northward towards the Snake River. Lowest elevations (1290 meters) occur in agricultural lands near the Snake River. Monument Peak (2454 meters) lies in the uplands within the mountainous, west central portion of the hydrographic unit. The Sawtooth National Forest administers most of this area. To the south, low hills and ridges characterize the hydrographic unit, while the northern one-third is relatively flat agricultural lands. Deadman Ridge and Middle Mountain flank respective western and eastern edges of the unit, while Big Draw and Cedar Mountain Draw lie in the south. Sagebrush dominates the landscape outside of agricultural areas, pinyon/juniper woodlands are found in the steeper uplands.

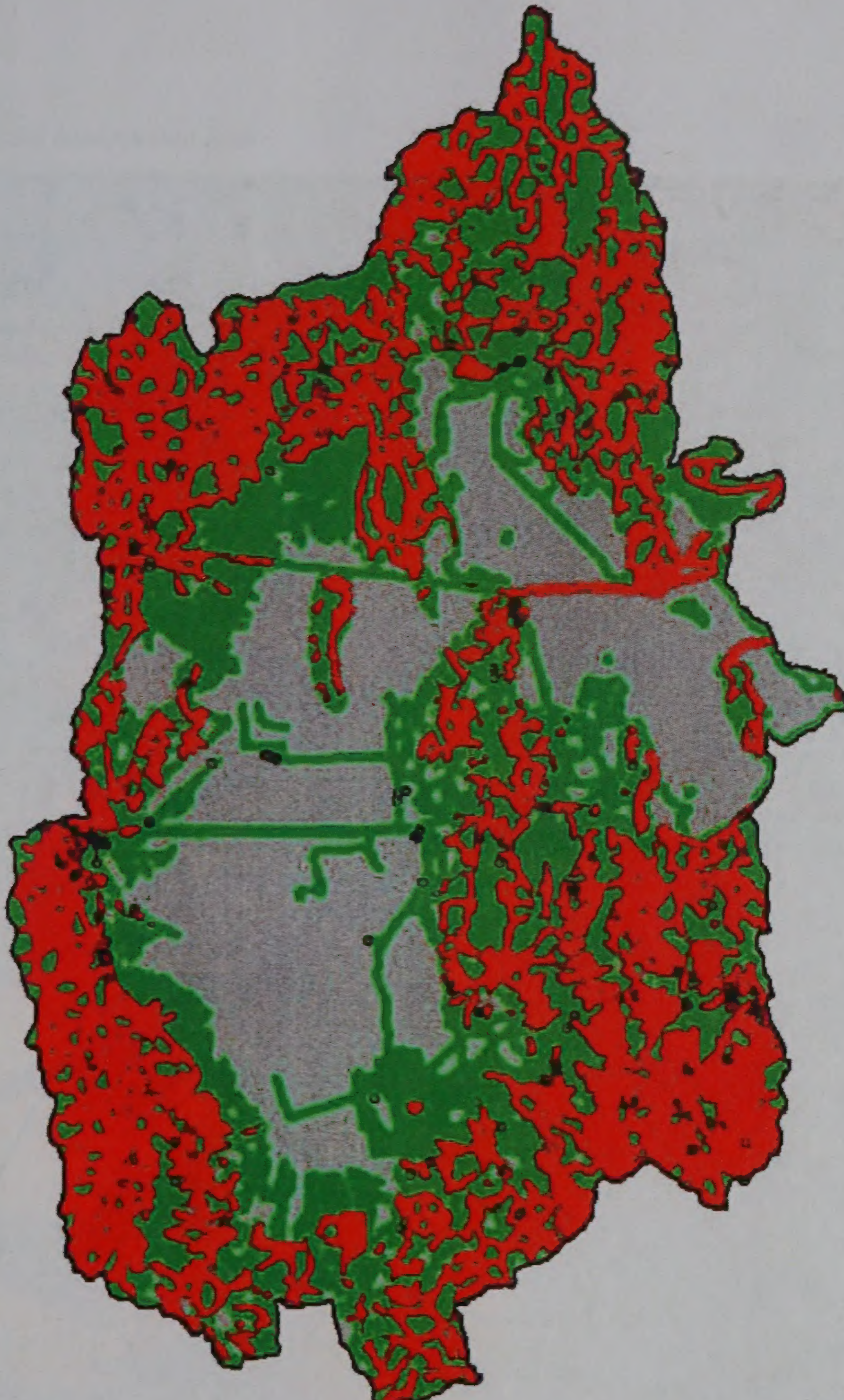


Figure 5.65 Great Salt Lake Analytic Unit Composite Probability - Historic

Salt Lake Analytic Unit
Historic Sites (Inventoried)
Historic Sites
Probability
Low
Medium
High
No Data

20 0 20 40 Miles
40 0 40 80 Kilometers
N

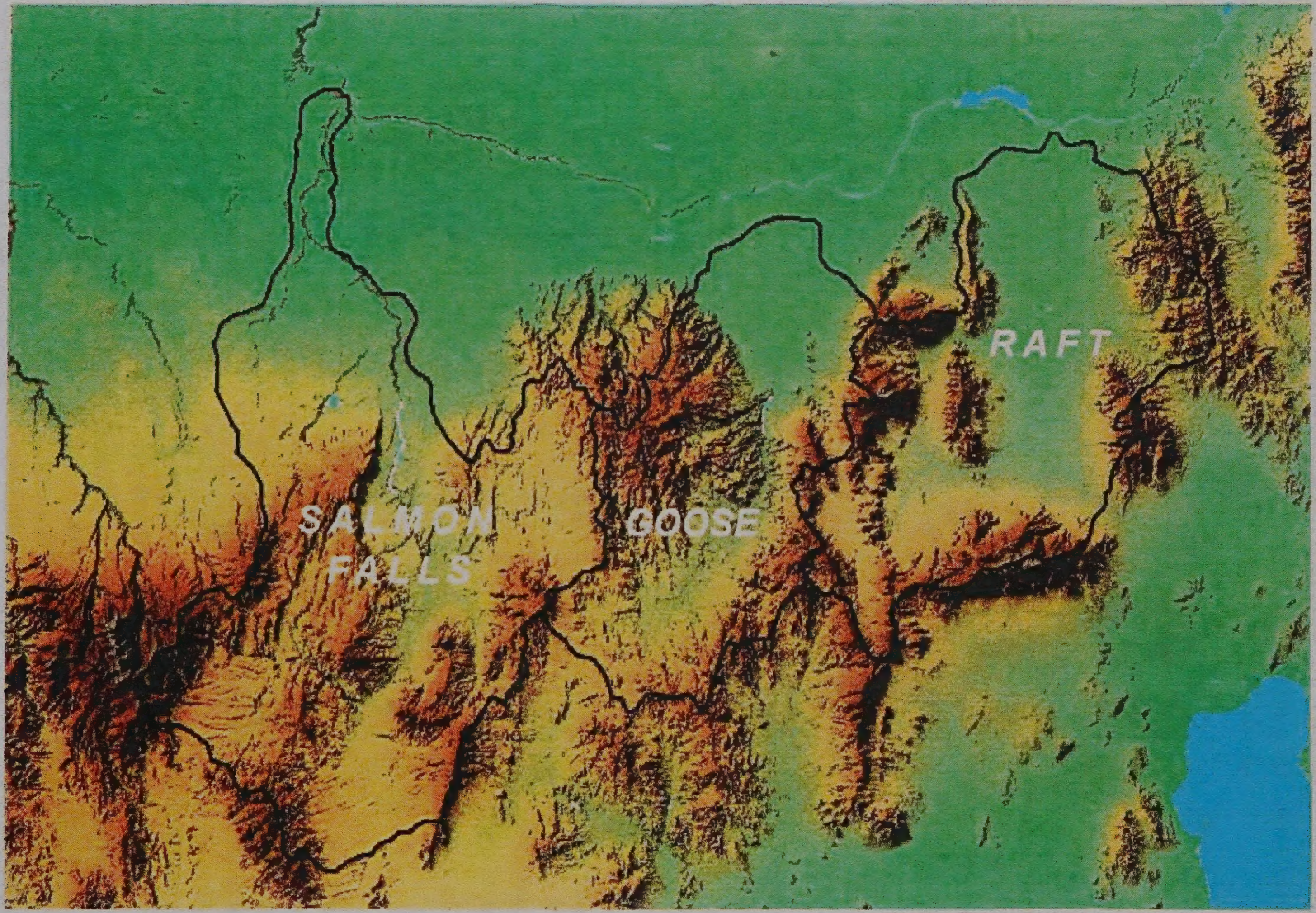


Figure 5.66 Upper Snake Analytic Unit

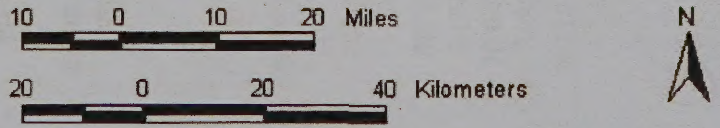


Table 5.32
Upper Snake Analytic Unit Area

CAT_NAME	REG_NAME	SUB_NAME	ACRES	HECTARES
Salmon Falls. Idaho, Nevada.	Pacific Northwest Region	Upper Snake	1,378,941	558,040
Raft. Idaho, Utah.	Pacific Northwest Region	Upper Snake	950,558	384,679
Goose. Idaho, Nevada, Utah.	Pacific Northwest Region	Upper Snake	743,316	300,811
		Total	3,072,815	1,243,529

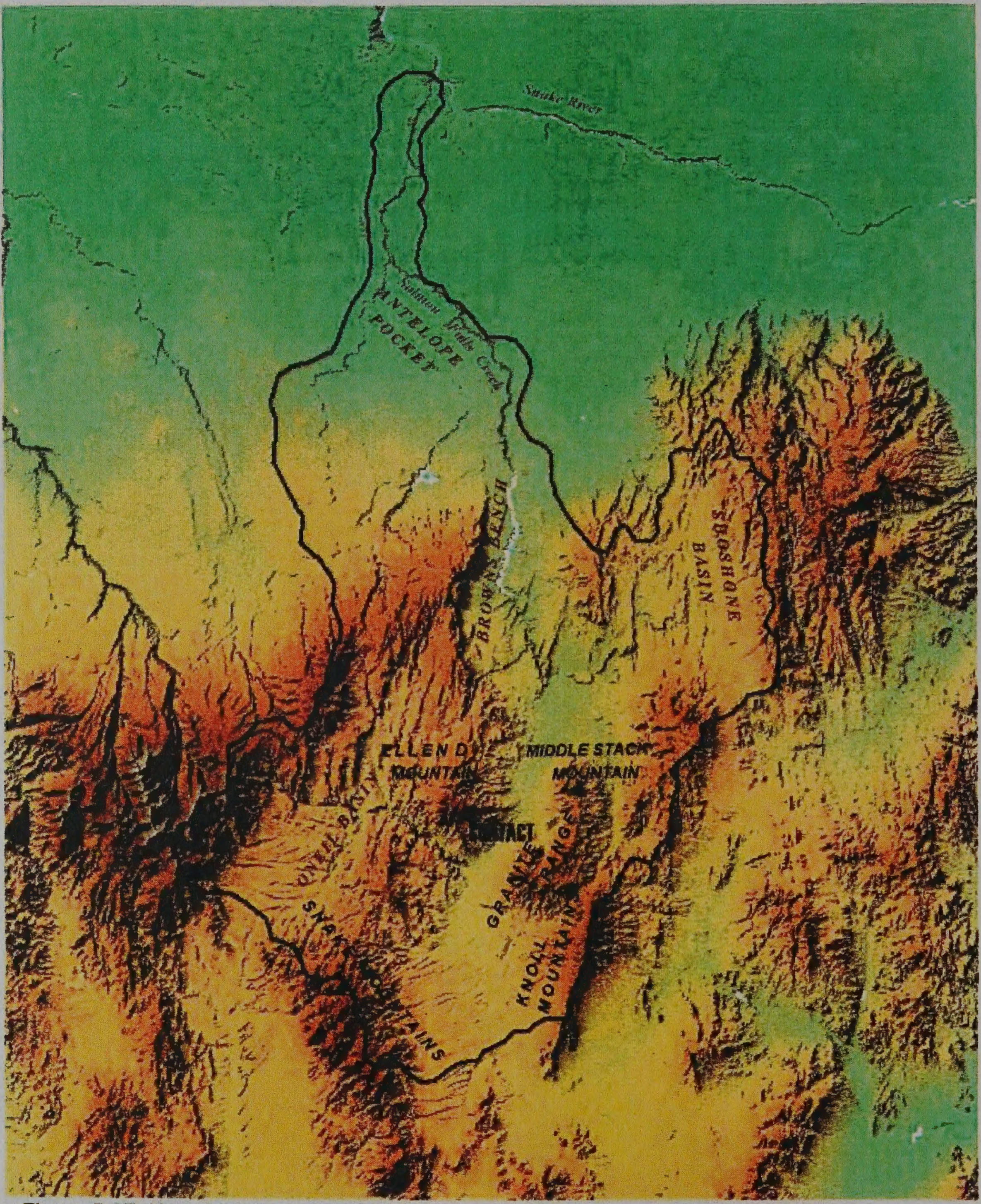


Figure 5.67 Upper Snake Analytic Unit - Salmon Falls Hydrographic Unit

10 0 10 20 Miles

20 0 20 40 Kilometers

N

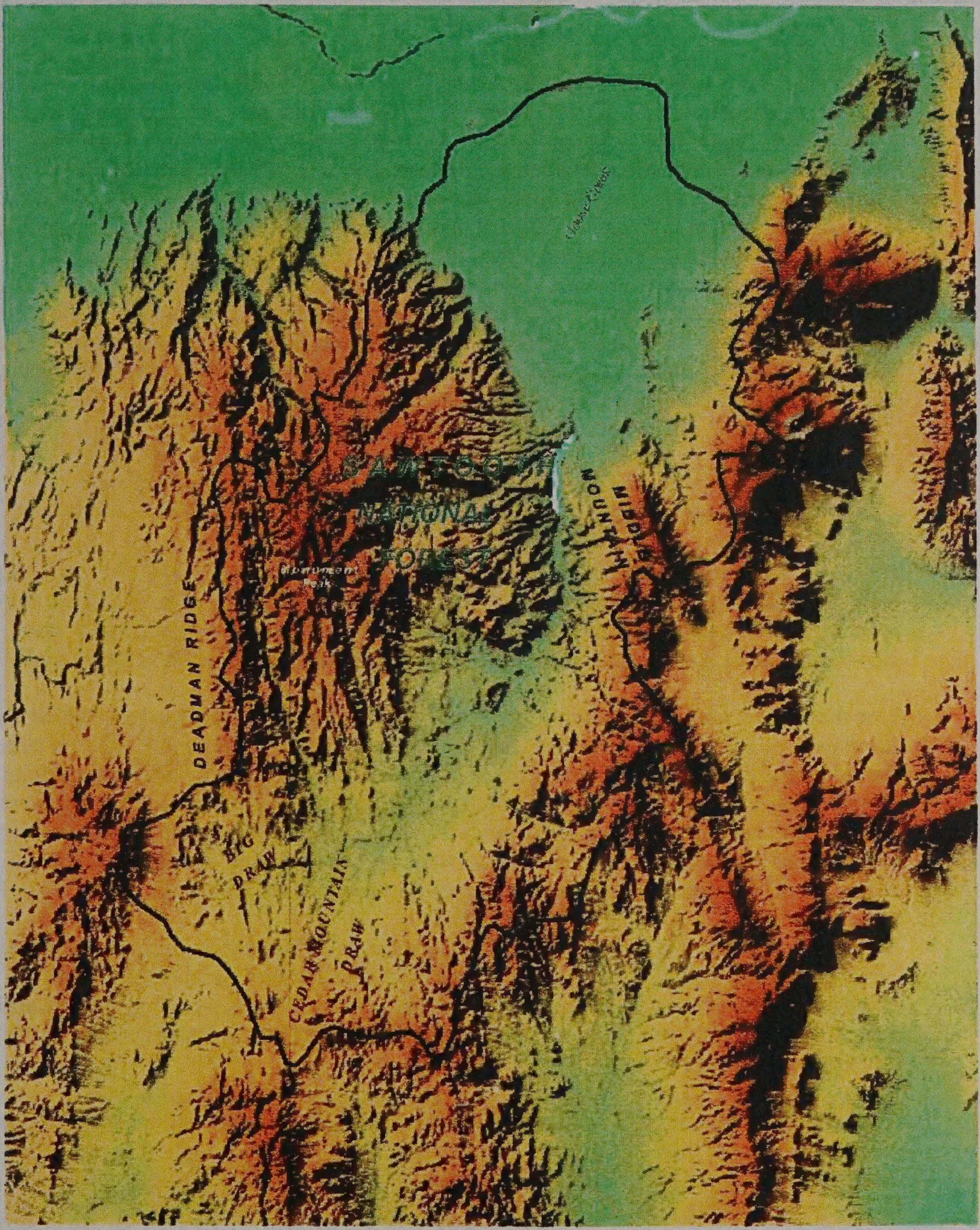


Figure 5.68 Upper Snake Analytic Unit - Goose Hydrographic Unit

5 0 5 10 Miles

10 0 10 20 Kilometers

N

Raft

Along the eastern side of the Upper Snake analytical unit, the Raft River and its tributaries create a major hydrologic feature. (Figure 5.69) The hydrographic unit lies within Idaho and Utah. Several ranges including the Jim Sage Mountains, Alison Mountains, Black Pine Mountains, and Middle Mountain bound this horseshoe-shaped basin. The Raft River Mountains provide a topographic divide between the Upper Snake sub-region and the Great Salt Lake sub-region to the south. Highest elevations occur at Cache Peak (3151 meters) and Mount Independence (3033 meters) along the western edge of the hydrographic unit. The Upper Raft River Valley, Junction Valley and the Holt Basin lie in the southern portion of the hydrographic unit. Basins in the south average approximately 1700 meters, while agricultural lands in the Raft River Valley lie at 1285 meters near the confluence of the Raft and Snake Rivers. Juniper and pinyon dominate higher elevations across the hydrographic unit. Sagebrush is the dominant non-cultivated plant community.

Analytic Results

Prehistoric Evidential Themes

Since a major portion of the Upper Snake analytic unit contained no spatial inventory data, statistical relationships between site and non-site components could not be evaluated. Site location data was derived primarily from Bureau of Land Management data sets. Forest Service and other agency lands within the analytic unit were not included in the analysis.

One thousand six hundred seventy-five prehistoric sites have been recorded on 8085 square kilometers of BLM land within the Upper Snake analytic unit. (Table 5.33) Weights tables for evidential themes were compiled using all weeded sites so that only one training point would occur within each analytic cell. Weeding reduced the total number of training points by approximately 20%. In each of the evidential themes the class with the highest positive contrast was selected as most predictive, with the remainder falling outside of the pattern regardless of whether contrast were positive or negative. (Table 5.34)

Within the vegetation evidential theme, the juniper steppe class and sagebrush zone have a positive contrast, while juniper/pinyon is least predictive for sites. Juniper steppe was considered inside the pattern since its contrast and positive weights were highest. The area of juniper is relatively small, 5.6% of the total analytic unit and weeded sites account for 10.6% of the total. (Figure 5.70)

The only positive contrast for distance from streams and springs is within the 0 to 200 meter buffer. Areas more than 1000 meters from water courses exhibit the highest negative contrast. Over 56% of the weeded sites are located within the 0 to 200 meter buffer. (Figure 5.71)

Areas within 1000 meters of potential wetlands, while relatively small (10.3% of the analytic unit) also have the highest contrast. Areas lying more than 5000 meters from potential

Table 5.33
Upper Snake Analytic Unit Site Summary

Potential Vegetation

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
2	Great Basin pine	89.3447	9	0.0000	0.00%	0
22	Juniper/pinyon	1154.7242	132	0.0000	0.00%	0
23	Juniper steppe	456.1014	205	0.0000	0.00%	0
25	Sagebrush	6337.2435	1327	0.0000	0.00%	0
26	Chaparral	33.0555	2	0.0000	0.00%	0
28	Desert shrub	13.1447	0	0.0000	0.00%	0
9999	Missing data	1.8164	0	0.0000	0.00%	0
-99	No data	0.0022	0	0.0000	0.00%	0
	Total	8085.4326	1675			

Streams and Springs

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
200	0-200m	2682.0261	960	0.0000	0.00%	0
400	200-400m	2119.4628	361	0.0000	0.00%	0
1000	400-1000m	2703.7093	283	0.0000	0.00%	0
2000	1000-2000m	489.8547	43	0.0000	0.00%	0
9999	>2000m	90.3799	8	0.0000	0.00%	0
	Total	8085.4328	1675			

Potential Wetlands

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
1000	0-1000m	837.5757	167	0.0000	0.00%	0
3000	1000-3000m	1217.4756	171	0.0000	0.00%	0
5000	3000-5000m	1050.3863	145	0.0000	0.00%	0
9999	>5000m	4978.1779	847	0.0000	0.00%	0
-99	No data	1.8172	0	0.0000	0.00%	0
	Total	8085.4327	1330			

Landform

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
1	Flat	3382.6925	774	0.0000	0.00%	0
2	Piedmont	2372.3473	460	0.0000	0.00%	0
3	Mountain	2330.3929	441	0.0000	0.00%	0
	Total	8085.4327	1675			

Slope

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
0-5	degrees	6275.5816	1193	0.0000	0.00%	0
5-15	degrees	1640.7576	392	0.0000	0.00%	0
15-30	degrees	161.7510	84	0.0000	0.00%	0
30-45	degrees	5.5379	6	0.0000	0.00%	0
>45	degrees	0.0060	0	0.0000	0.00%	0
	Missing data	1.8164	0	0.0000	0.00%	0
	Total	8085.4305	1675			

Roads (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
200	0-200m	1853.0306	64	0.0000	0.00%	0
400	200-400m	1448.6531	26	0.0000	0.00%	0
600	400-600m	1145.9296	13	0.0000	0.00%	0
800	600-800m	903.8147	3	0.0000	0.00%	0
1000	800-1000m	697.3002	1	0.0000	0.00%	0
9999	>1000m	2036.6830	12	0.0000	0.00%	0
	Total	8085.4112	119			

Water (Historic)

CLASS		Model Area	Total # Sites	Inv. Area sq.	% Inventory	Inv. # Sites
200	0-200m	2682.0261	53	0.0000	0.00%	0
400	200-400m	2119.4628	25	0.0000	0.00%	0
1000	400-1000m	2703.7093	37	0.0000	0.00%	0
9999	>1000m	580.2346	4	0.0000	0.00%	0
	Total	8085.4328	119			

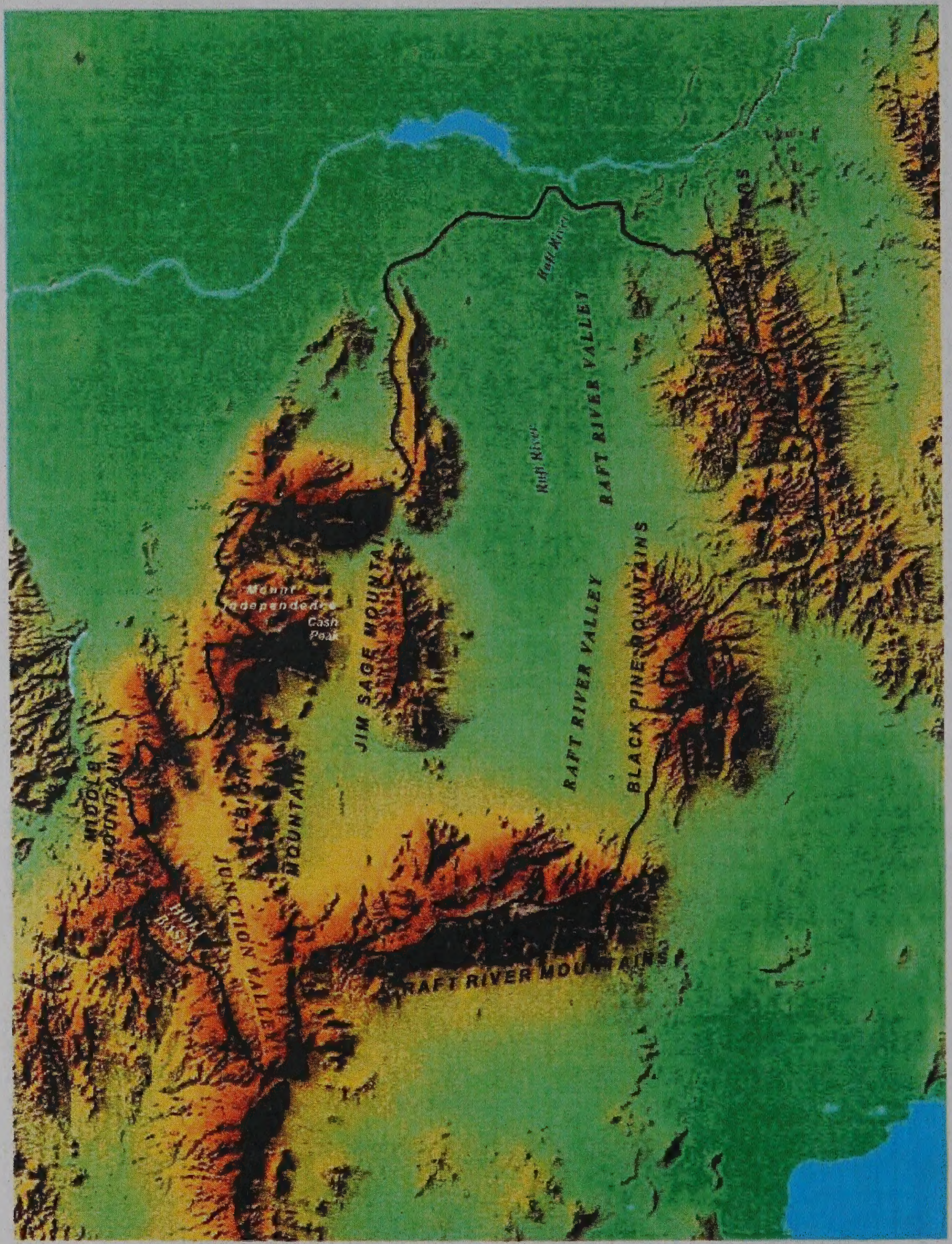


Figure 5.69 Upper Snake Analytic Unit - Raft Hydrographic Unit

Table 5.34
Upper Snake Analytic Unit Prehistoric Evidential Theme Weights

Potential Vegetation										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
2	Great Basin pine	89	357	7	9	-0.7560	0.0060	-0.7621	0.3828	-1.99
22	Juniper/pinyon	1155	4619	105	132	-0.6039	0.0744	-0.6783	0.1030	-6.59
23	Juniper steppe	456	1824	142	205	0.6695	-0.0563	0.7258	0.0928	7.82
25	Sagebrush	6337	25349	1074	1327	0.0312	-0.1212	0.1524	0.0712	2.14
26	Chaparral	33	132	2	2	-1.0190	0.0027	-1.0217	0.7131	-1.43
28	Desert shrub	13	53	0	0	0.0000	0.0000	0.0000	0.0000	0.00
9999	Missing data	2	7	0	0	0.0000	0.0000	0.0000	0.0000	0.00
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	8085		1330	1675					

Streams and Springs										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	2682	10728	761	980	0.5709	-0.4541	1.0250	0.0570	17.98
400	200-400m	2119	8478	293	361	-0.1681	0.0539	-0.2220	0.0675	-3.29
1000	400-1000m	2704	10815	230	283	-0.6762	0.2268	-0.9030	0.0738	-12.23
2000	1000-2000m	490	1959	39	43	-0.7614	0.0346	-0.7960	0.1663	-4.79
9999	>2000m	90	362	7	8	-0.7630	0.0062	-0.7692	0.3827	-2.01
	Total	8085		1330	1675					

Potential Wetlands										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1000	0-1000m	838	3350	167	237	0.1794	-0.0228	0.2022	0.0862	2.35
3000	1000-3000m	1217	4870	171	245	-0.1662	0.0270	-0.1932	0.0841	-2.30
5000	3000-5000m	1050	4202	145	201	-0.1802	0.0245	-0.2047	0.0902	-2.27
9999	>5000m	4978	19913	847	992	0.0392	-0.0659	0.1051	0.0587	1.79
-99	No data	2	7	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	8085		1330						

Slope										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
0-5	degrees	6276	25102	936	1193	-0.1019	0.2942	-0.3961	0.0616	-6.43
5-15	degrees	1641	6563	311	392	0.1483	-0.0412	0.1895	0.0663	2.86
15-30	degrees	162	647	78	84	1.1620	-0.0419	1.2039	0.1241	9.70
30-45	degrees	6	22	5	6	1.9165	-0.0032	1.9197	0.5090	3.77
>45	degrees	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
9999	Missing data	2	7	0	0	0.0000	0.0000	0.0000	0.0000	0.00
-99	No data	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.00
	Total	8085		1330	1675					

Landform										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
1	Flat	3383	13531	591	774	0.0629	-0.0476	0.1106	0.0564	1.96
2	Piedmont	2372	9489	363	460	-0.0753	0.0298	-0.1051	0.0628	-1.67
2	Mountain	2330	9322	376	441	-0.0201	0.0080	-0.0282	0.0622	-0.45
	Total	8085		1330	1675					

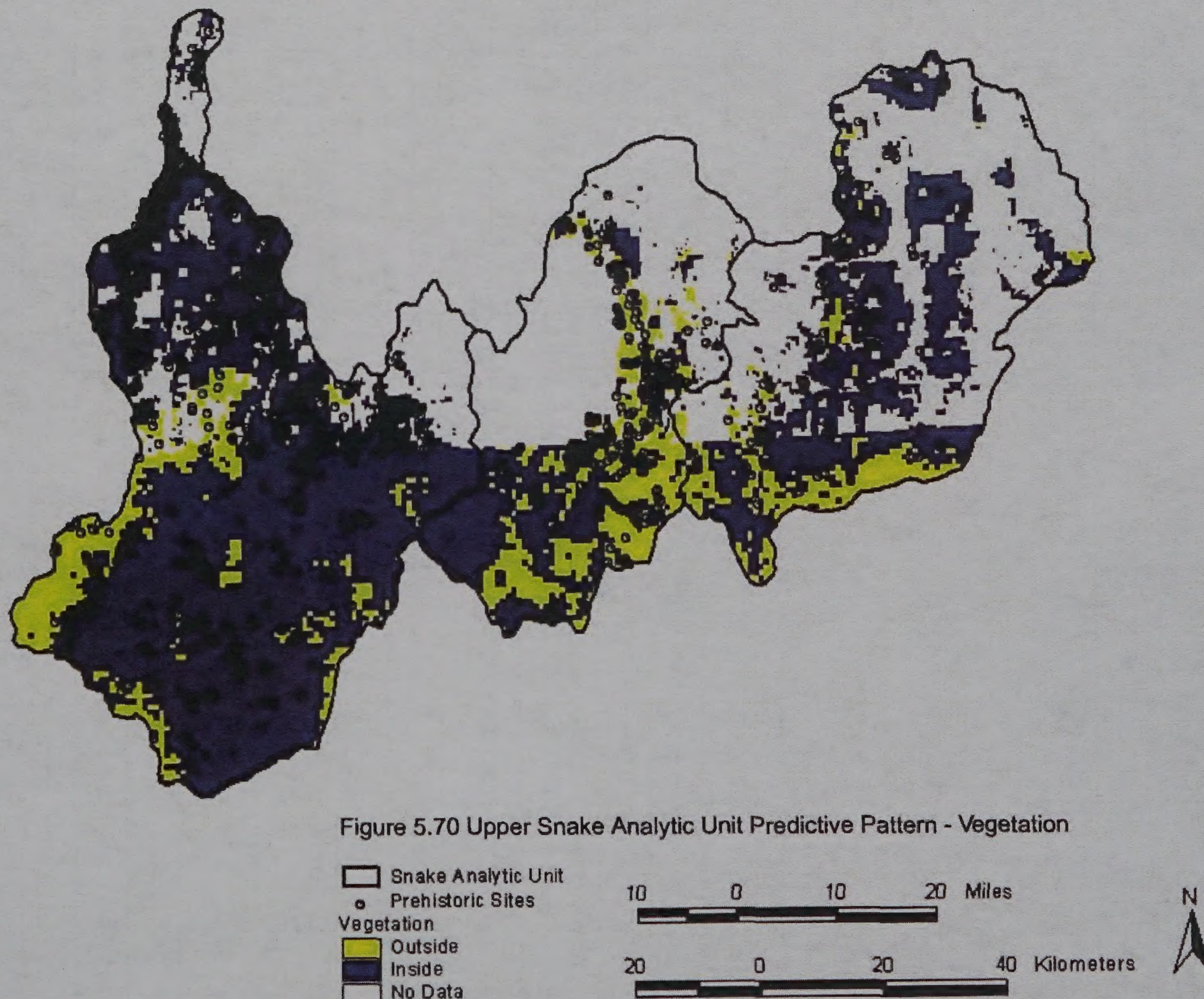


Figure 5.70 Upper Snake Analytic Unit Predictive Pattern - Vegetation

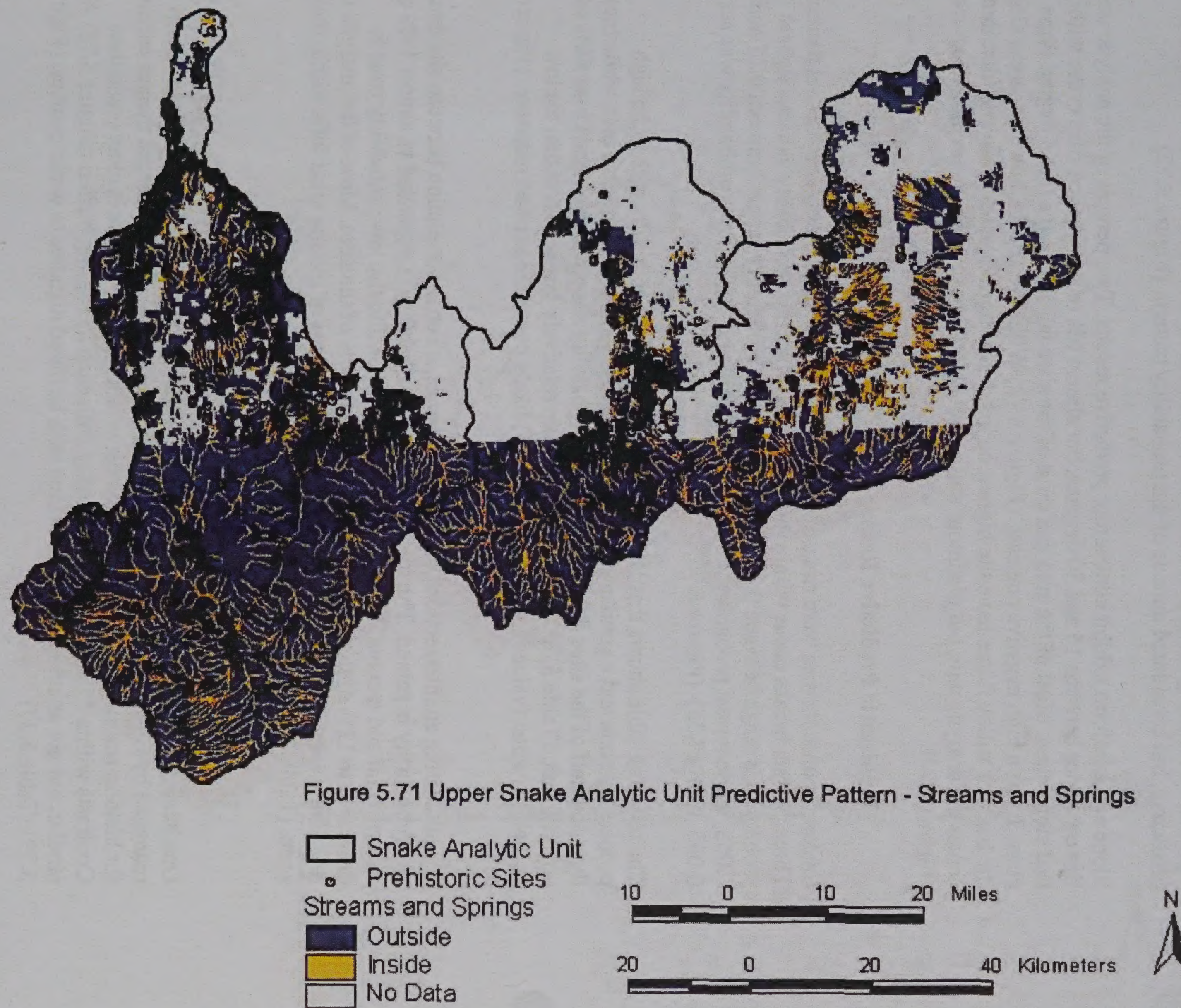


Figure 5.71 Upper Snake Analytic Unit Predictive Pattern - Streams and Springs

wetlands cover the greatest proportion of the analytic unit. They are also moderately predictive, but considered outside of the probability pattern. (Figure 5.72)

Slope and landform exhibit contrasting predictive results. Two percent of the analytic unit lies on slopes between 15 and 30 degrees, but almost 6% of the weeded sites occur within that slope class. Most of the area and most of the sites fall within the 0 to 5 degree slope class. It has a high negative contrast. (Figure 5.73) Within landform, however, areas along the basin or valley floors have the highest contrast. Landform classes are evenly distributed across the analytic unit, but piedmont and mountain both have negative predictive contrasts. (Figure 5.74)

Prehistoric Predictive Response

Snake response themes were run using most predictive classes for each evidential theme. Three distinct breaks occur within the normalized posterior probability values. Highest probabilities range between 0.24 and 0.17, medium probability ranges between 0.17 and 0.058, while lowest probabilities fall between 0.058 and 0.021. Prior probability was set at 0.045. (Table5.35) (Figure 5.75)

The resulting table shows that less than 1% of the analytic unit falls within the high probability zone and a similar percentage of sites are associated with that area while more than one-half of the sites fall within the low probability zone which extends over 66% of the analytic unit. (Table 5.36) Site densities within relatively large cells within the low probability zone (values 8 and 7) (Table 5.35) likely cause the skewed response. (Figure 5.76)

By calculating an intersection of predictive themes, a better correlation between site density and probability is gained. The total area of high probability is expanded to almost 19% of the analytic unit and it contains nearly 24% of the sites, while the low probability zone is decreased to 12% of the analytic unit and includes 8% of the sites. Most of the analytic unit lies within areas of medium probability (70%) and most of the site areal falls within that zone. (Table 5.36) (Figure 5.77)

Historic Evidential Themes

One hundred nineteen historic sites were recorded within the 8085 square kilometers of land managed by BLM. (Table 5.32) Within both the road and water evidential themes considered for historic resources, the buffered class between 0 and 200 meters is most predictive. Contrasts within roads decline consistently with each increasing buffer. (Figure 5.78) A similar, but not as striking decline occurs with buffered distance to water courses. (Figure 5.79) (Table 5.37)

Historic Predictive Response

Three breaks are evident in the historic response theme when the area within 200 meters of roads and water are selected as predictive classes. Breaks occur at normalized posterior

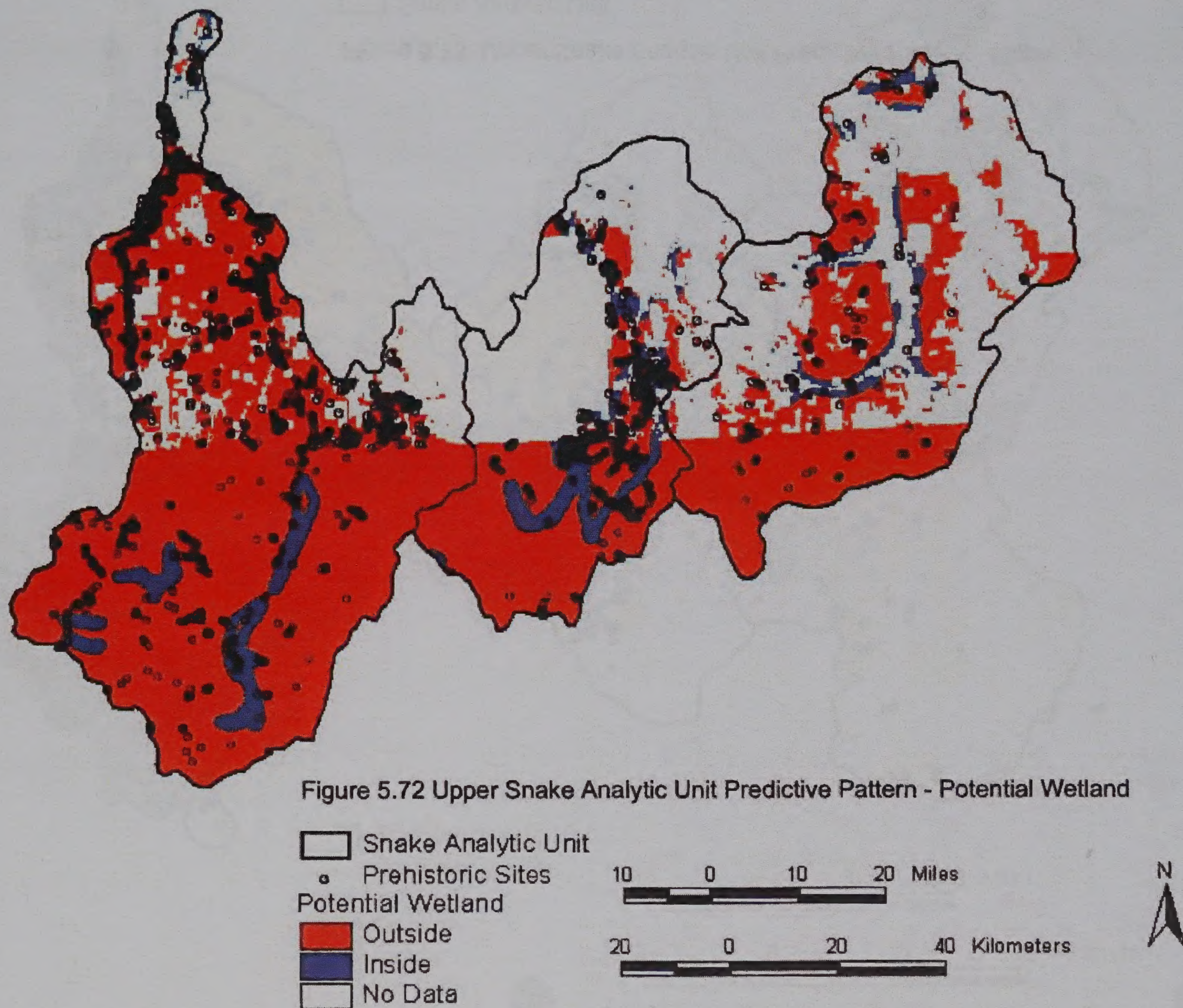


Figure 5.72 Upper Snake Analytic Unit Predictive Pattern - Potential Wetland

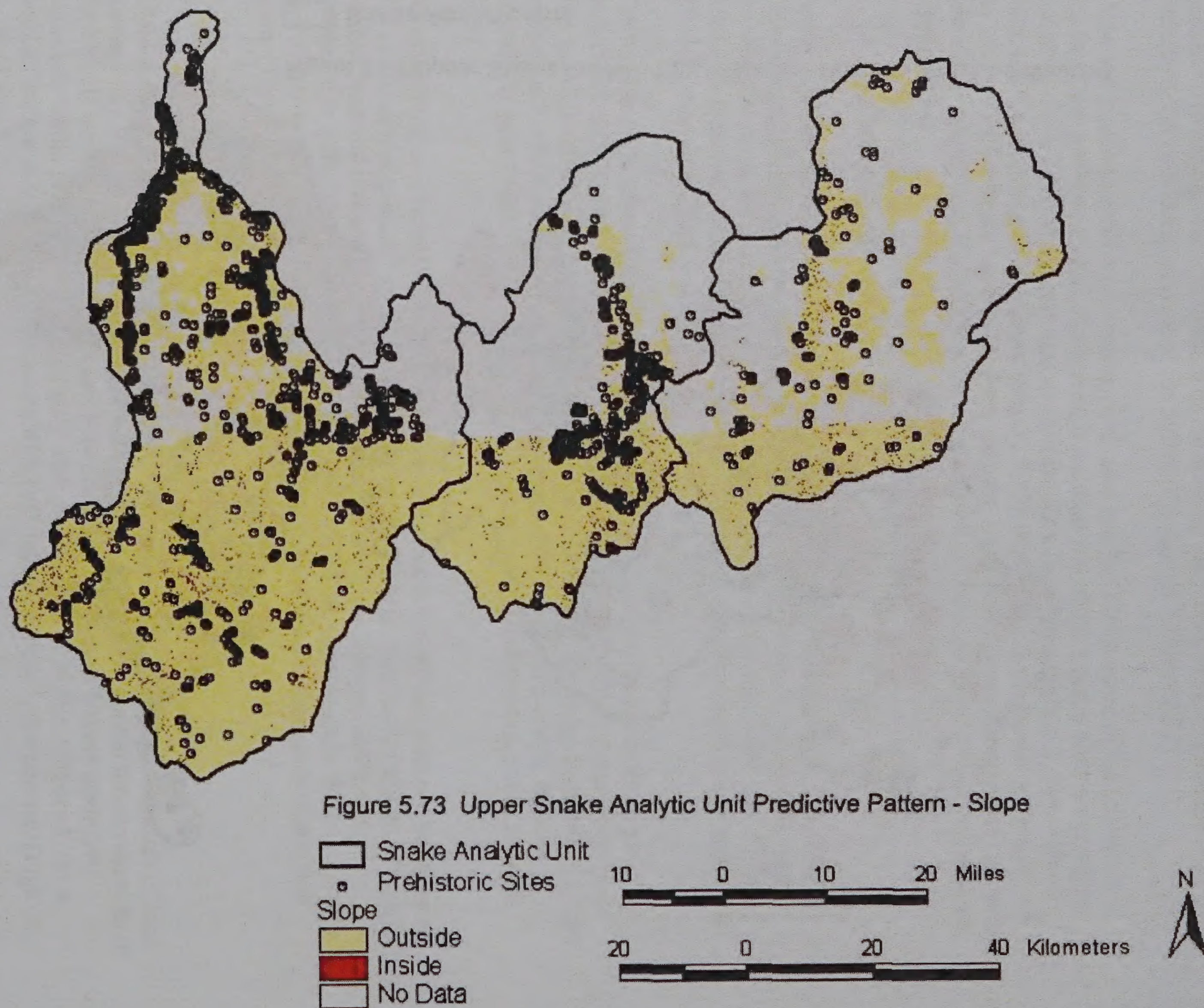


Figure 5.73 Upper Snake Analytic Unit Predictive Pattern - Slope

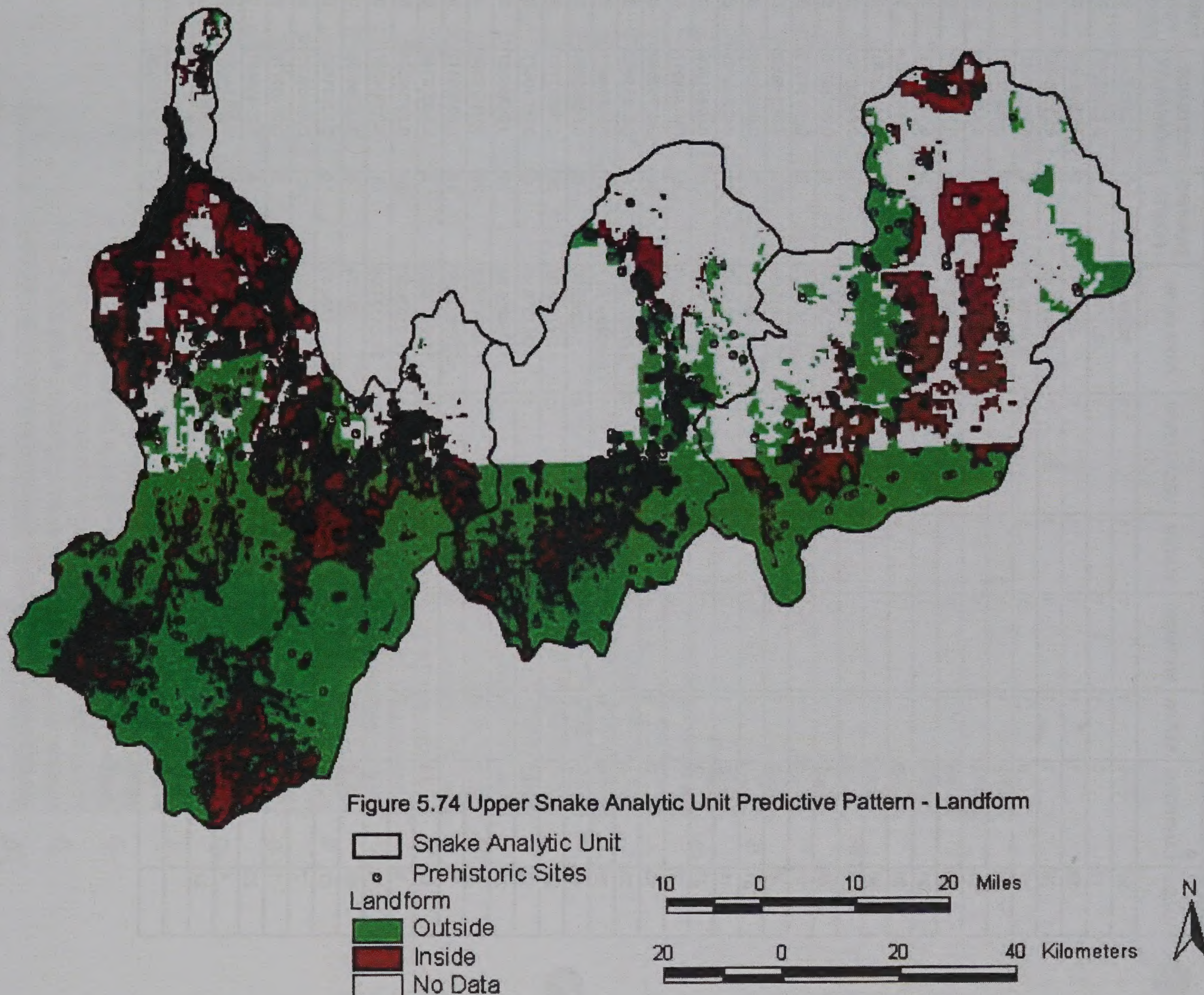


Figure 5.74 Upper Snake Analytic Unit Predictive Pattern - Landform

Table 5.35
Upper Snake Analytic Unit Prehistoric Resp

VALUE	LANDFORM	SLOPE	WETLAND	WATER	VEGETATION	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
22	1	1	1	1	1	535471.01	0	0.25315044	0.25134325	High
13	0	1	1	1	1	3601582.47	1	0.23283357	0.23117142	
35	1	1	1	1	0	55111.06	0	0.22548562	0.22387592	
26	1	1	0	1	1	4380584.80	6	0.21265760	0.21113948	
17	0	1	1	1	0	2146352.50	1	0.20677431	0.20529819	
24	0	1	0	1	1	55619723.62	52	0.19474314	0.19335291	
34	1	1	0	1	0	507170.73	0	0.18830222	0.18695797	
29	0	1	0	1	0	22079428.33	1	0.17199129	0.17076348	
21	1	1	1	0	1	280023.78	0	0.10717000	0.10640493	Med
20	0	1	1	0	1	3075048.39	1	0.09704658	0.09635378	
36	1	1	1	0	0	14894.88	0	0.09346184	0.09279463	
5	1	0	1	1	1	164502055.78	34	0.09230753	0.09164857	
25	1	1	0	0	1	2295301.32	1	0.08729816	0.08667496	
19	0	1	1	0	0	2325091.08	2	0.08451075	0.08390744	
6	0	0	1	1	1	67695749.20	29	0.08345682	0.08286104	
31	1	0	1	1	0	18079407.77	7	0.08032940	0.07975594	
14	0	1	0	0	1	36715139.39	10	0.07888601	0.07832286	
33	1	1	0	0	0	350774.47	0	0.07591569	0.07537374	
9	1	0	0	1	1	907618889.93	220	0.07496017	0.07442504	
16	0	0	1	1	0	50641854.06	25	0.07253540	0.07201758	
30	0	1	0	0	0	27769273.26	3	0.06851803	0.06802889	
10	0	0	0	1	1	926049072.17	285	0.06764881	0.06716588	
11	1	0	-99	1	0	90858.78	0	0.06665904	0.06618317	
32	1	0	0	1	0	64241626.07	28	0.06507171	0.06460718	
12	0	0	-99	1	0	246510.30	0	0.06010473	0.05967565	
28	0	0	0	1	0	393934625.93	72	0.05866367	0.05824488	
2	1	0	1	0	1	272307487.98	34	0.03476099	0.03451284	Low
3	0	0	1	0	1	152158667.07	16	0.03123812	0.03101512	
18	1	0	1	0	0	19125773.23	3	0.03000346	0.02978927	
8	1	0	0	0	1	1811231056.59	223	0.02789599	0.02769685	
15	0	0	1	0	0	81031137.06	14	0.02694927	0.02675688	
38	0	-99	-99	0	-99	744.74	0	0.02596039	0.02577506	
37	0	-99	0	0	-99	1489.49	0	0.02531592	0.02513519	
7	0	0	0	0	1	1929177669.20	162	0.02505079	0.02487196	
1	1	0	-99	0	0	800599.91	0	0.02466779	0.02449169	
23	1	0	0	0	0	116275406.84	35	0.02405461	0.02388289	
4	0	0	-99	0	0	678461.88	0	0.02214435	0.02198627	
27	0	0	0	0	0	947792620.91	65	0.02159251	0.02143837	
						Prior Probability		0.04250000		

Figure 5.75 Upper Snake Analytic Unit Observed Breaks

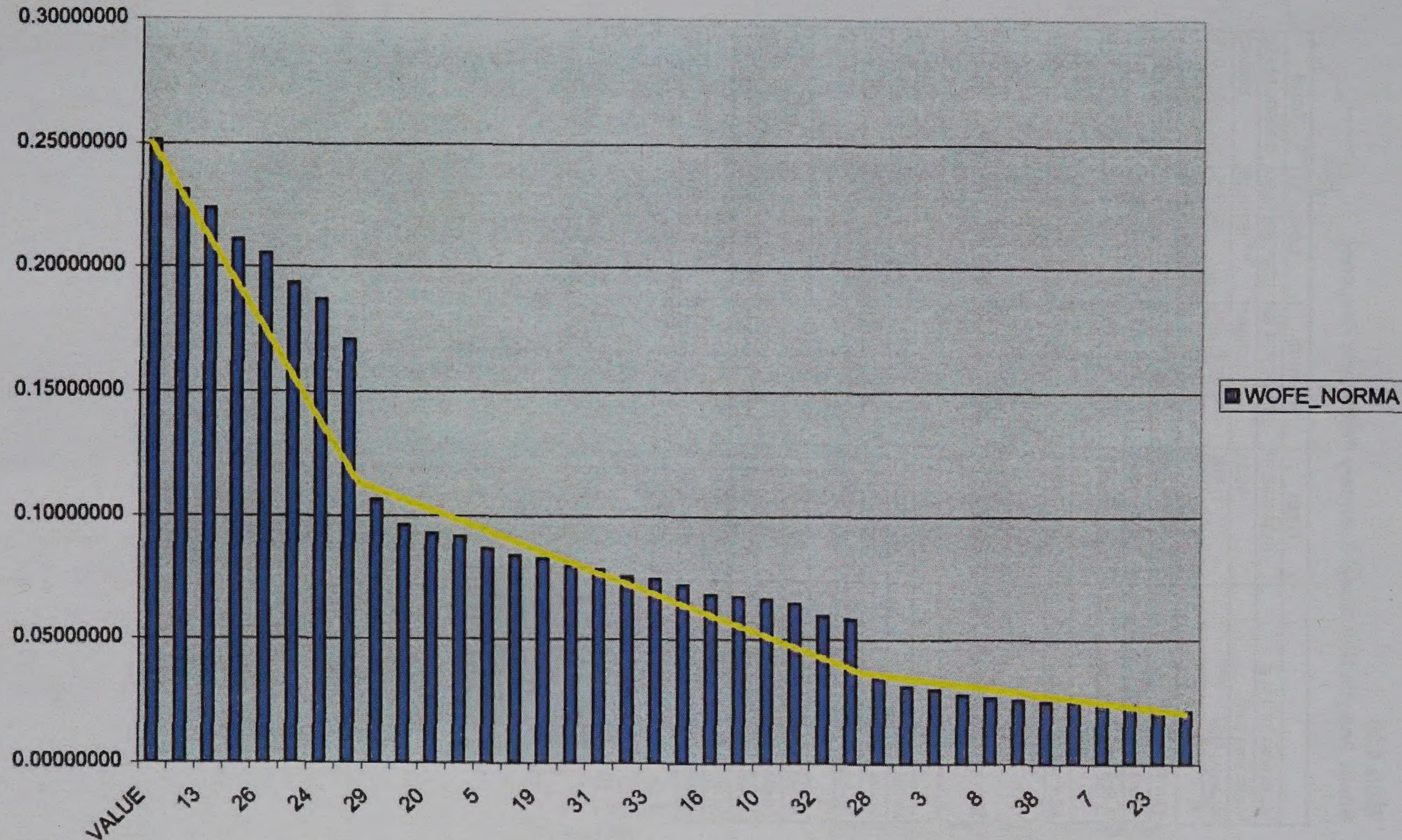


Table 5.36
Snake Analytic Unit Model Summary Prehistoric Response

	High	Medium	Low	Total
Model area (m^2)	66845996.19	2688005624.89	5330581114.90	8085432735.98
Model area (km^2)	66.85	2688.01	5330.58	8085.43
% Model area	0.83%	33.25%	65.93%	100.00%
All sites area (m^2)	146714.59	8248785.50	9463463.00	17858963.09
All sites area (km^2)	0.15	8.25	9.46	17.86
% Site area	0.82%	46.19%	52.99%	100.00%
All site area / model area	**0.0022**	**0.0031**	**0.0018**	**0.0022**

Snake Analytic Unit Model Summary Prehistoric Composite

	High (5-3)	Medium (2-1)	Low (0)	Total
Model area (m^2)	1502714880.00	5633106432.00	947792640.00	8083613952.00
Model area (km^2)	1502.71	5633.11	947.79	8083.61
% Model area	18.59%	69.69%	11.72%	100.00%
All sites area (m^2)	4224933.50	12259977.00	1378521.38	17863431.88
All sites area (km^2)	4.22	12.26	1.38	17.86
% Site area	23.65%	68.63%	7.72%	100.00%
All site area / model area	**0.0028**	**0.0022**	**0.0015**	**0.0022**

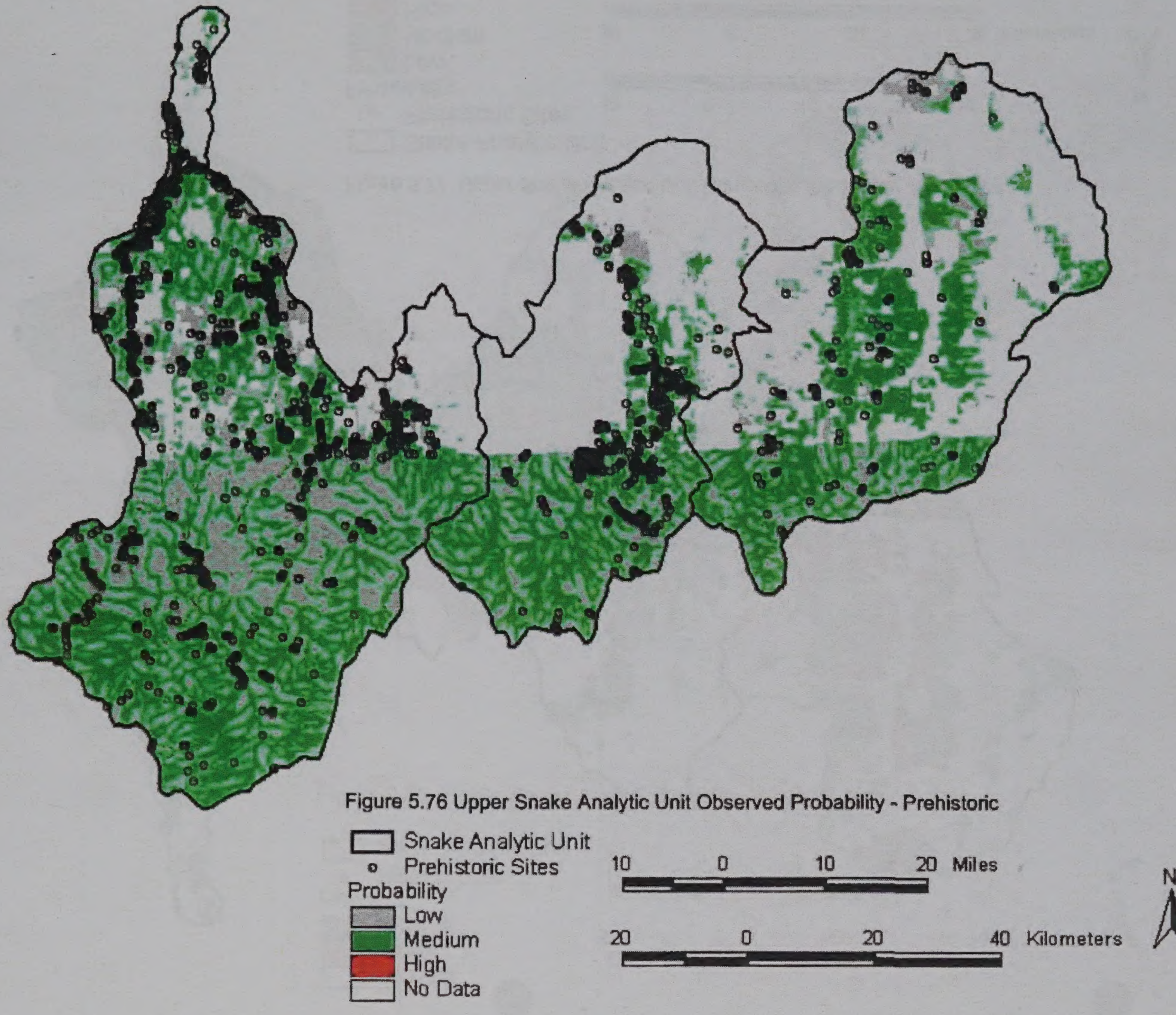


Figure 5.76 Upper Snake Analytic Unit Observed Probability - Prehistoric

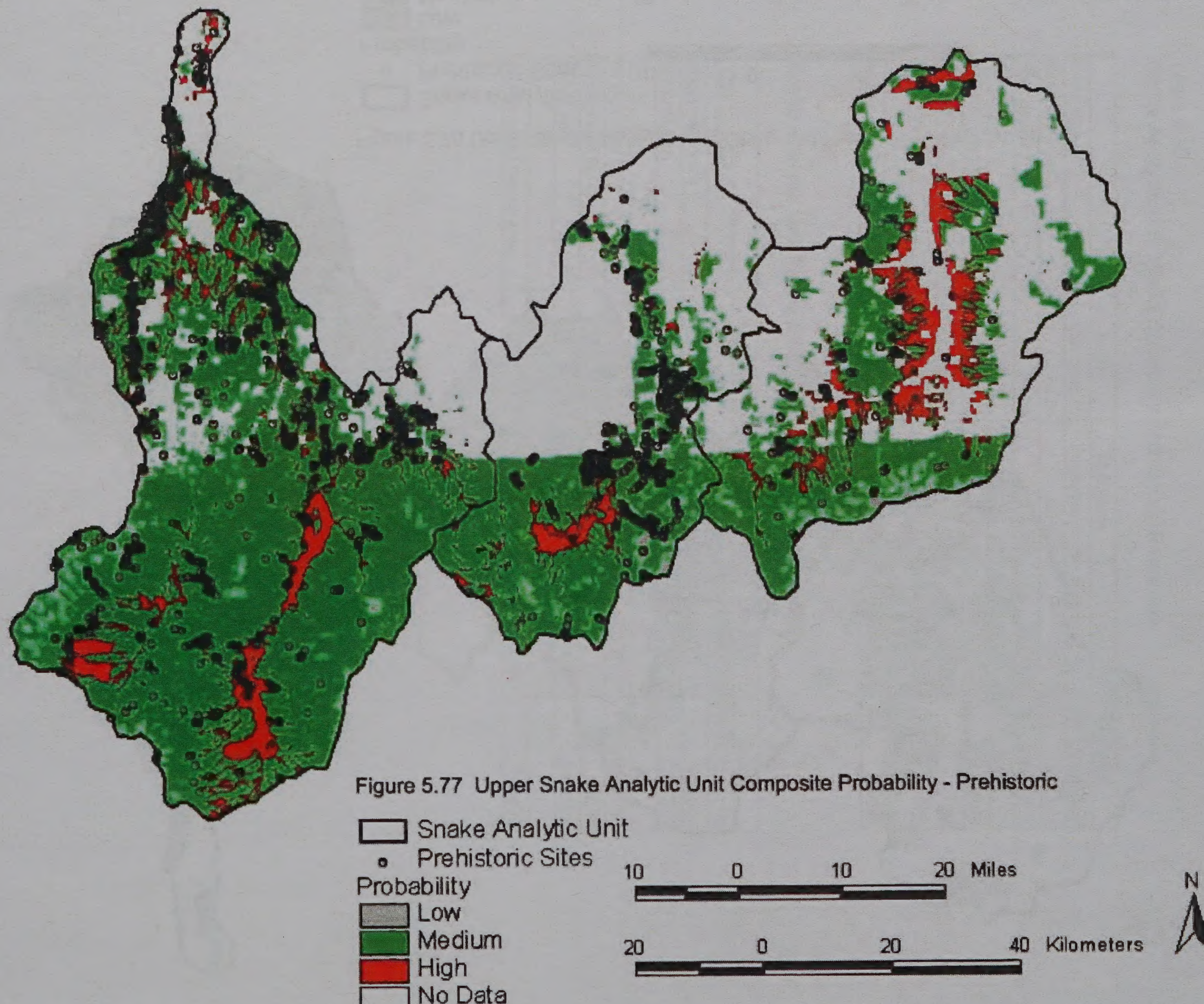


Figure 5.77 Upper Snake Analytic Unit Composite Probability - Prehistoric

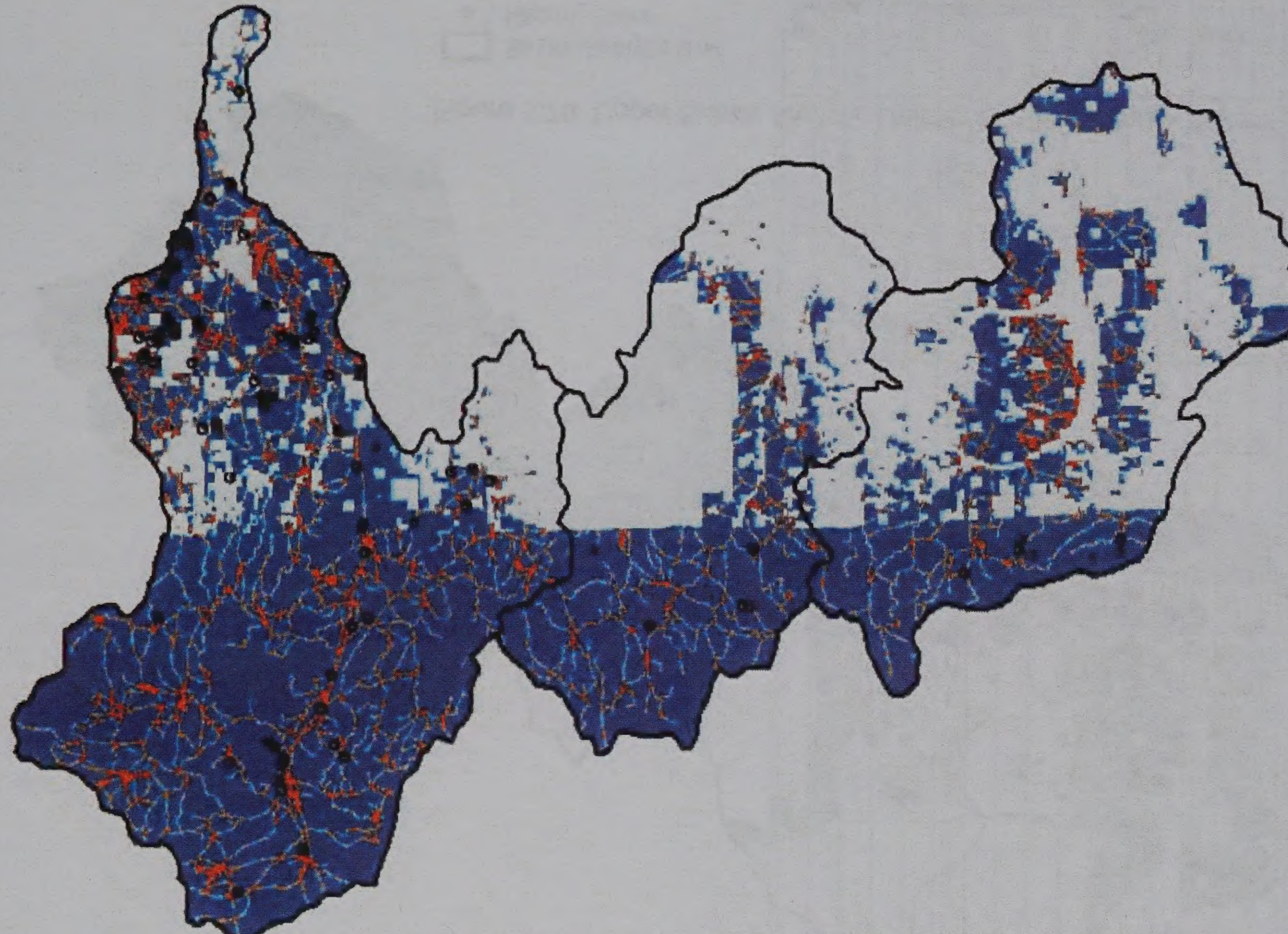
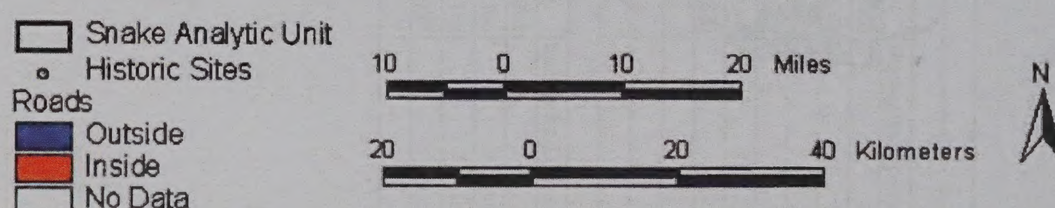


Figure 5.78 Upper Snake Analytic Unit Predictive Pattern - Roads



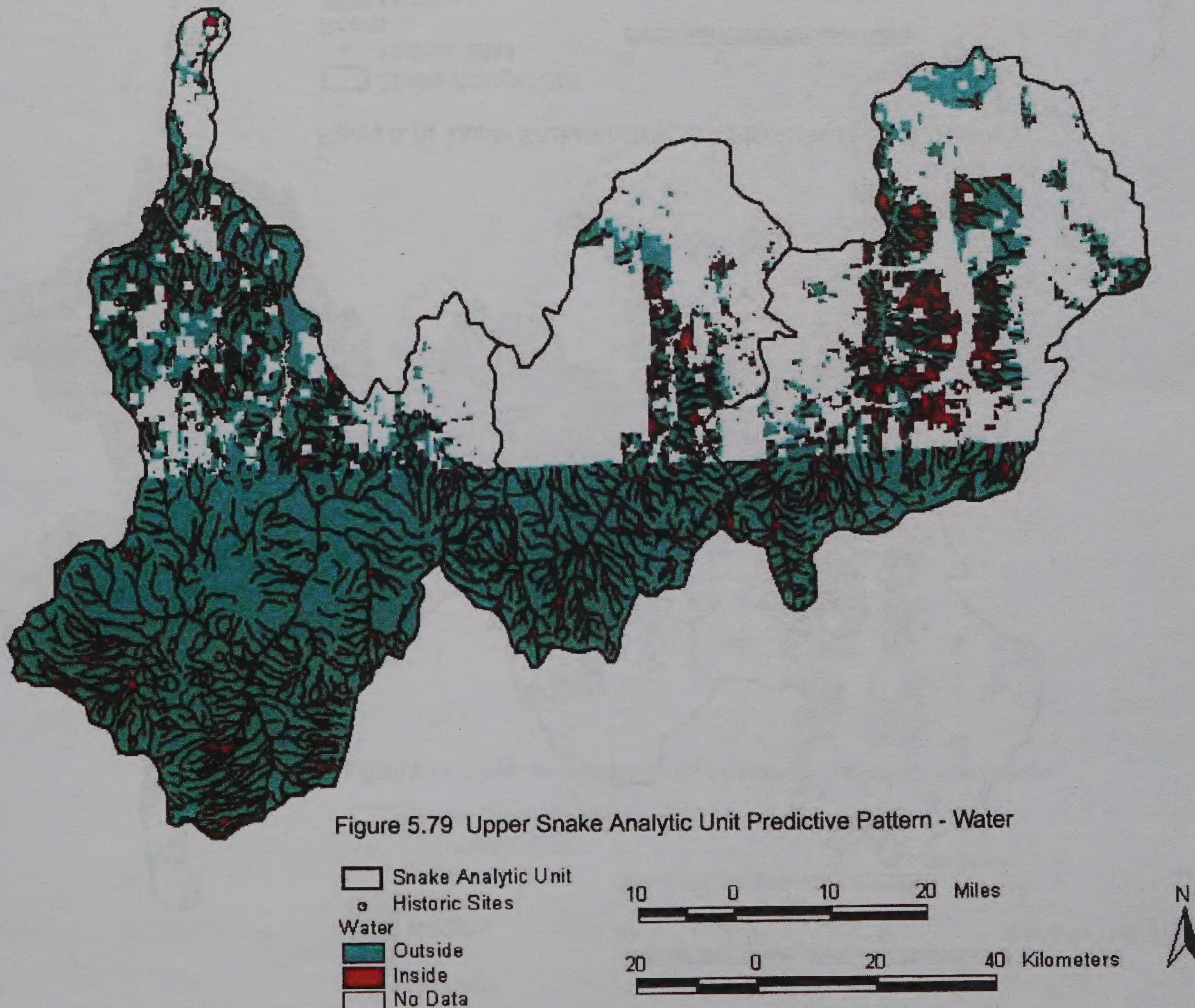


Figure 5.79 Upper Snake Analytic Unit Predictive Pattern - Water

Table 5.37
Upper Snake Analytic Unit Historic Evidential Theme Weights

ALL SITES										
Roads										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	1853	7412	58	64	0.8748	-0.5333	1.4081	0.1956	7.1997
400	200-400m	1449	5795	23	26	0.1922	-0.0473	0.2395	0.2361	1.0144
600	400-600m	1146	4584	11	13	-0.3126	0.0434	-0.3560	0.3189	-1.1164
800	600-800m	904	3615	3	3	-1.3761	0.0901	-1.4662	0.5860	-2.5022
1000	800-1000m	697	2789	1	1	-2.2158	0.0810	-2.2967	1.0049	-2.2854
9999	>1000m	2037	8147	10	12	-0.9842	0.1918	-1.1760	0.3325	-3.5364
	Total	8085		106	119					
Streams and Springs										
CLASS		Area sq.km	500m Cells	# Points	# Sites	W+	W-	Contrast	Contrast std. dev.	Normalized Contrast
200	0-200m	2682	10728	48	53	0.3125	-0.2006	0.5130	0.1955	2.6243
400	200-400m	2119	8478	23	25	-0.1896	0.0596	-0.2492	0.2360	-1.0560
1000	400-1000m	2704	10815	31	37	-0.1344	0.0613	-0.1957	0.2138	-0.9153
9999	>1000m	580	2321	4	4	-0.6443	0.0361	-0.6804	0.5102	-1.3338
	Total	8085		106	119					

probabilities of 0.006 and 0.0027, the prior probability was set at 0.0033. (Table 5.38) (Figure 5.80) Summary tables show that the high probability area has the smallest extent (less than 10% of the analytic unit) while 77% of the analytic unit falls within the low probability zone and 13% falls within medium probability. (Figure 5.81) Sites are evenly distributed across probability zones with approximately one-third of the sites within each zone. (Table 5.39) Proximity to water but not roads, and distances greater than 200 meters for either evidential theme, fall within the low probability zone. Again, the number of training points relative to low probability area biases the response pattern.

Summary calculation of the predictive classes creates a modified response with better site to area ratios between probability zones. Training points associated with distance to water but not roads are included in the medium probability zone with the summary calculation. The composite summary produces a 25% reduction to the areas of the low probability zone and corresponding increase in the extent of the medium zone. (Table 5.39) One-third of the sites still remain in the high probability zone, while almost one-half fall within zones of moderate probability. The remainder of sites lie within the low probability zone. (Figure 5.82)

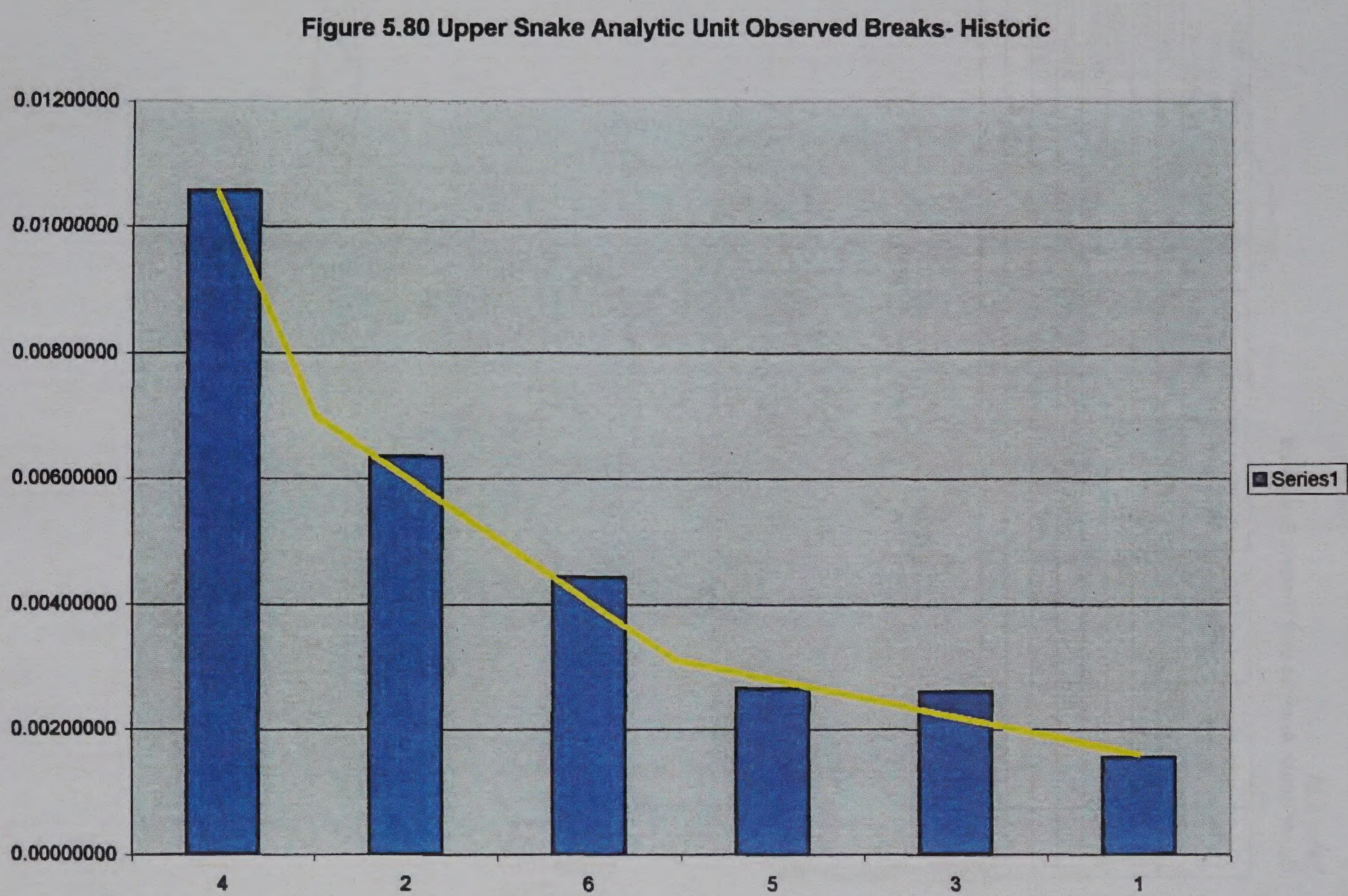


Figure 5.80 Upper Snake Analytic Unit Observed Breaks- Historic
0.01200000
0.01000000
0.00800000
0.00600000
0.00400000
0.00200000
0.00000000
4
2
6
5
3
1
Series1

Table 5.38
Upper Snake Analytic Unit Historic Response

VALUE	HISTORIC WATER	ROADS	AREA sq. m.	TRAINING POINTS	POSTERIOR PROBABILITY	NORMALIZED POSTERIOR PROBABILITY	
4	1	1	765081571.88	25	0.01076458	0.01057429	High
2	0	1	1087948992.07	33	0.00647204	0.00635763	Med
6	1	-99	5213.21	0	0.00451659	0.00443675	
5	0	-99	16384.37	0	0.00270871	0.00266083	Low
3	1	0	1916939289.40	23	0.00265469	0.00260776	
1	0	0	4315441285.03	25	0.00159089	0.00156277	
				Prior Probability	0.00330000		

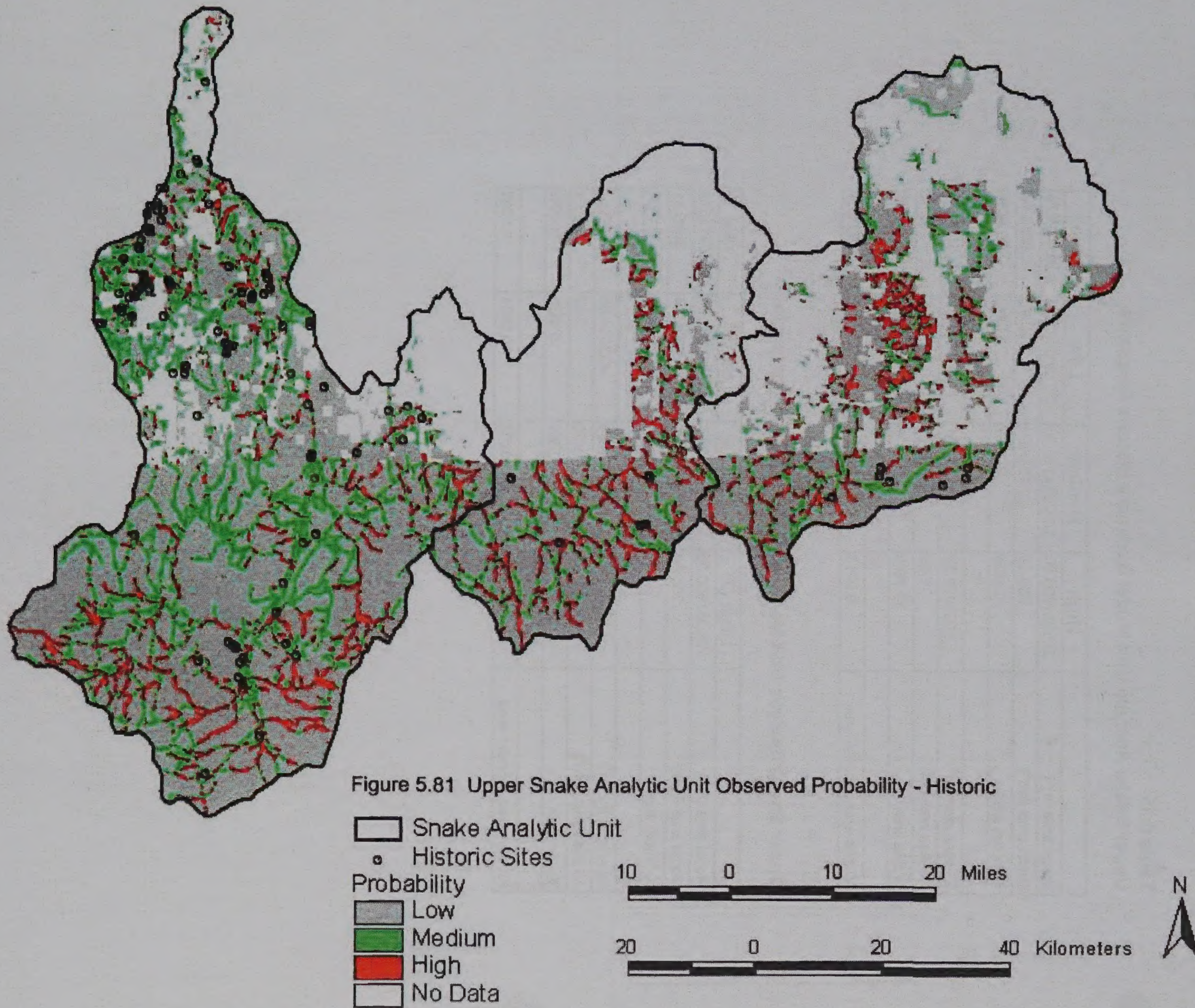


Figure 5.81 Upper Snake Analytic Unit Observed Probability - Historic

Table 5.39
Upper Snake Analytic Unit Model Summary Historic Response

	High	Medium	Low	Total
Model area (m^2)	765081600.00	1087954176.00	6232396800.00	8085432576
Model area (km^2)	765.08	1087.95	6232.40	8085.43
% Model area	9.46%	13.46%	77.08%	100.00%
All sites area (m^2)	1023278.38	779002.31	905608.81	2707889.50
All sites area (km^2)	1.02	0.78	0.91	2.71
% Site area	37.79%	28.77%	33.44%	100.00%
All site area / model area	**0.0013**	**0.0007**	**0.0001**	**0.0003**

Upper Snake Analytic Unit Model Summary Historic Composite

	High (2)	Medium (1)	Low (0)	Total
Model area (m^2)	765081600.00	3004888320.00	4315441152.00	8085411072
Model area (km^2)	765.08	3004.89	4315.44	8085.41
% Model area	9.46%	37.16%	53.37%	100.00%
All sites area (m^2)	1023278.38	1261596.50	423014.66	2707889.53
All sites area (km^2)	1.02	1.26	0.42	2.71
% site area	37.79%	46.59%	15.62%	100.00%
All site area / model area	**0.0013**	**0.0004**	**0.0001**	**0.0003**

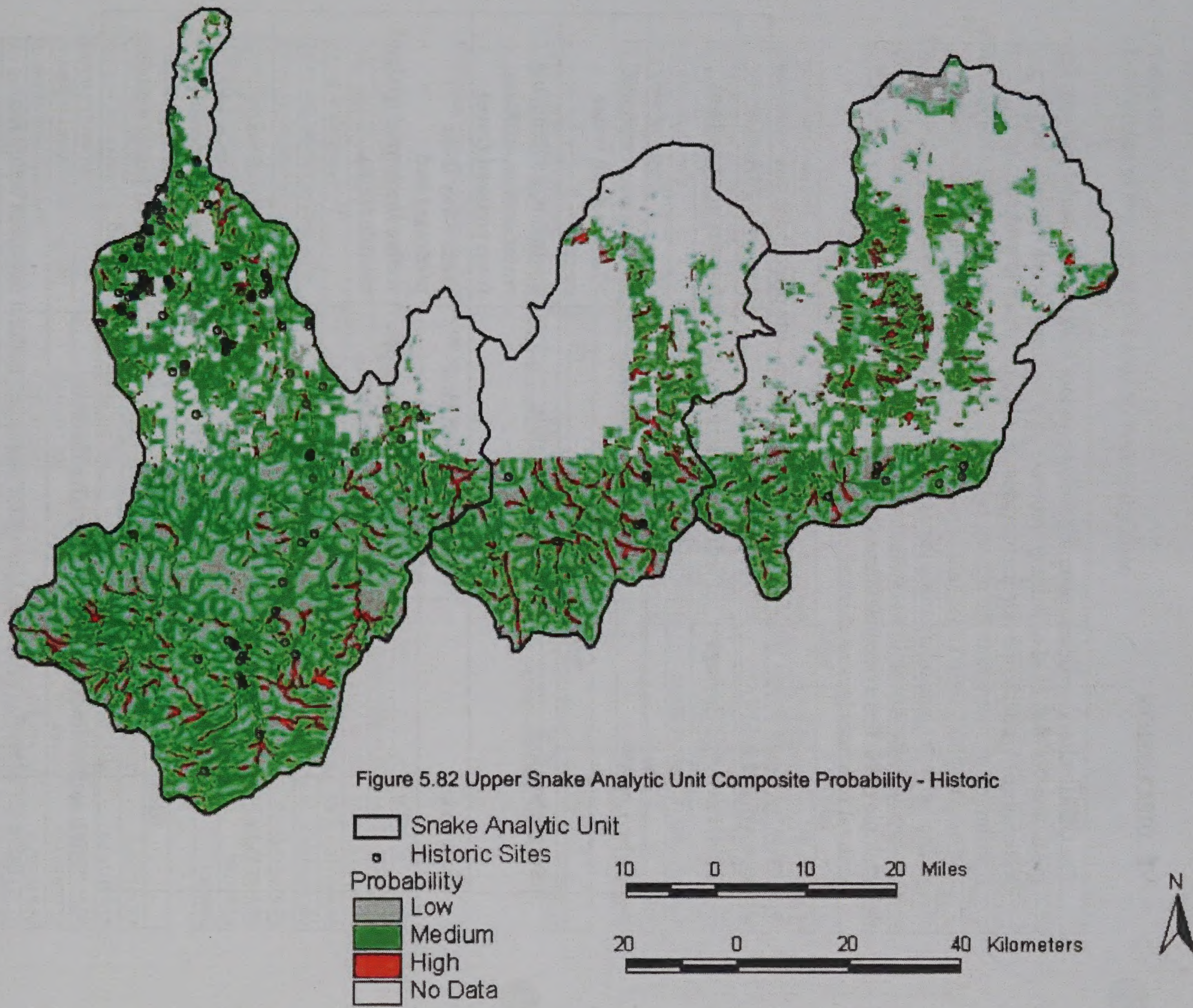


Figure 5.82 Upper Snake Analytic Unit Composite Probability - Historic

VI. DISCUSSION

The GBRI cultural resources planning model provides a statistically useful indicator for predicting the likelihood of cultural resources on a landscape level. The statistical technique of Weights of Evidence provides an adequate means to evaluate the distribution of sites within the chosen evidential themes, but some caution is required due to biases resulting from site to unit area ratios. That bias hold through calculations of predictive responses. Intersecting themes provided the most reliable means of identifying probability. The probability of encountering cultural resources is highest in areas where multiple predictive evidential themes intersect, while the likelihood of encountering cultural resources lessens as fewer predictive themes are encountered.

Table 6.1. Summary of weighting factors for prehistoric site presence in analytical units

Analytical Unit	Positive Factors	Negative Factors*
Pilot/Thousand Springs	**Piedmont, desert shrub, within 1000m of potential wetland**	**(no strong negatives)**
Ruby/Long	**<1000m from wetland, piedmont**	**>3000m from wetland, >2000m from water course**
Spring/Steptoe	**valley floors, flats, sagebrush**	**piedmont, <500m from water course, >5000m from wetland (rare)**
Salt Lake	**wetland and potential wetland proximity (1000m), piedmont slopes, proximity to piedmont and wetland and piedmont/montane margin (rockshelters?)**	**areas away from piedmont and wetland/potential wetland combinations**
Snake	**0-200m from water courses**	**>1000m from water courses (uplands and interfluves); secondary correlation to vegetation pattern of juniper due to upland**

***High slope values are always a negative factor**

Table 6.1 identifies predictive classes for prehistoric cultural resources within each evidential theme for each analytic unit within the study area. Each predictive class identifies a landscape element as a potentially predictive surface, and combinations of predictive surfaces increase the probability of encountering a cultural resource within that area. For example, within the Pilot/Thousand Springs Analytic Unit, activities within the

Table 6.2
Distribution of Prehistoric Site Area by Probability Zone

	High	Medium	Low	Total
Pilot Model Area (m^2)	362,405,888.00	2,155,450,368.00	2,059,061,760.00	4,576,918,016.00
Ruby Model Area (m^2)	2,693,271,808.00	5,691,043,840.00	2,072,421,760.00	10,456,737,408.00
Spring Model Area (m^2)	4,943,192,576.00	3,486,458,368.00	5,357,499,904.00	13,787,150,848.00
Great Salt Lake Model Area (m^2)	1,599,121,920.00	12,245,988,352.00	27,664,097,280.00	41,509,207,552.00
Snake Model Area (m^2)	1,502,714,880.00	5,633,106,432.00	947,792,640.00	8,083,613,952.00
Total Model Area (m^2)	**11,100,707,072.00**	**29,212,047,360.00**	**38,100,873,344.00**	**63,379,972,352.00**
Total Model Area (km^2)	**11,100.71**	**29,212.05**	**38,100.87**	**63,379.97**
% Model Area	**17.51%**	**46.09%**	**60.12%**	**100.00%**

	High	Medium	Low	Total
Pilot All Sites Area (m^2)	3,291,769.00	10,133,733.00	4,945,845.50	18,371,347.50
Ruby All Sites Area (m^2)	14,991,699.00	16,013,488.00	3,885,330.00	34,890,517.00
Spring All Sites Area (m^2)	21,368,942.00	6,834,516.50	12,127,413.00	40,330,871.50
Great Salt LakeAll Sites Area (m^2)	3,270,916.00	11,951,653.00	12,302,428.00	27,524,997.00
Snake All Sites Area (m^2)	4,224,933.50	12,259,977.00	1,378,521.38	17,863,431.88
All Sites Area (m^2)	**47,148,259.50**	**57,193,367.50**	**34,639,537.88**	**138,981,164.88**
All Sites Area (km^2)	**47.15**	**57.19**	**34.64**	**138.98**
% Site Area	**33.92%**	**41.15%**	**24.92%**	**100.00%**

	High	Medium	Low	Total
All Site area / Model area	0.0042	0.0020	0.0009	0.0022

Note: Total area may vary between prehistoric and historic composite analysis due to grid variation within the vegetation evidential theme.

Distribution of Historic Site Area by Probability Zone

	High	Medium	Low	Total
Pilot Model Area (m^2)	1,652,891,008.00		2,969,638,912.00	4,622,529,920.00
Ruby Model Area (m^2)	947,938,560.00	3,813,766,656.00	5,844,430,848.00	10,606,136,064.00
Spring Model Area (m^2)	859,979,840.00	5,939,859,456.00	6,978,998,272.00	13,778,837,568.00
Great Salt Lake Model Area (m^2)	15,518,270,464.00	14,305,559,552.00	11,821,988,864.00	41,645,818,880.00
Snake Model Area (m^2)	765,081,600.00	3,004,888,320.00	4,315,441,152.00	8,085,411,072.00
Total Model Area (m^2)	**19,744,161,472.00**	**27,064,073,984.00**	**31,930,498,048.00**	**78,738,733,504.00**
Total Model Area (km^2)	**19,744.16**	**27,064.07**	**31,930.50**	**78,738.73**
% Model Area	**25.08%**	**34.37%**	**40.55%**	**100.00%**

	High	Medium	Low	Total
Pilot All Sites Area (m^2)	2,138,905.00		192,888.72	2,331,793.72
Ruby All Sites Area (m^2)	1,735,253.75	2,366,796.75	545,152.69	4,647,203.19
Spring All Sites Area (m^2)	1,426,929.75	4,950,314.00	1,163,290.25	7,540,534.00
Great Salt LakeAll Sites Area (m^2)	8,448,377.00	3,560,621.50	160,864.72	12,169,863.22
Snake All Sites Area (m^2)	1,023,278.38	1,261,596.50	423,014.66	2,707,889.53
All Sites Area (m^2)	**14,772,743.88**	**12,139,328.75**	**2,485,211.03**	**29,397,283.66**
All Sites Area (km^2)	**14.77**	**12.14**	**2.49**	**29.40**
% Site Area	**50.25%**	**41.29%**	**8.45%**	**100.00%**

	High	Medium	Low	Total
All Site area / Model area	0.0007	0.0004	0.0001	0.0004

Table 6.3 Spring/Steptoe Model Summary and Additional Data

Model Summary

	Inv. Area sq.km	% Inventory Analytic Unit	% Inventoried Area	# Inv. Sites	%Total Sites	CONTRAST
Flat	273.20	3.9%	70.5%	336	80.4%	0.8134
Piedmont	76.94	2.8%	19.9%	65	15.6%	-0.5140
Mountain	37.23	1.0%	9.6%	17	4.1%	-1.2013
Total	387.36	2.8%	100.0%	418	100.0%	

Additional Data

	New Survey sq.km	% Increase from Model	New Inv Area sq.km.	% Inventory Analytic Unit	% Inventoried Area	New Sites	% Site Increase from Model	Total Inv. Sites	%Total Sites	New CONTRAST
Flat	14.10	5.2%	287.30	3.9%	63.4%	54	16.1%	390.00	67.2%	0.2393
Piedmont	34.52	44.9%	111.45	5.6%	24.6%	102	156.9%	167.00	28.8%	0.3209
Mountain	17.15	46.1%	54.38	1.0%	12.0%	7	41.2%	24.00	4.1%	-1.4648
Total	65.77	17.0%	453.14	3.43%	100.0%	163	39.0%	580	100.0%	

desert shrub vegetation zone, lying upon piedmont landforms, and within 1000 meters of potential wetland areas would have the highest probability of encountering sites, while sites less likely to occur in areas where those conditions are not met. With the possible exception of potential wetlands, the evidential classes are readily identifiable at the field level and provide a basis for evaluating probability of encountering cultural resources.

Historic resources are much easier to predict – they are nearly always within 1000 meters of perennial water sources and (not surprisingly) within 500 meters of roads.

An analysis of composite probabilities for the study area as a whole quantifies the effectiveness of the model. For prehistoric sites, high probability zones cover 17% of the entire study and contain 33% of the all site areas, while low probability zones extend over 60% of the study area, but contain only 25% of the sites. (**Table 6.2; Figure 6.1**) The remaining 41% of the site area falls within 46% of the study area. Historic sites and probability zones exhibit a similar pattern. (**Table 6.2; Figure 6.2**) Twenty-five percent of the study area contains 50% of the historic site area while 40% of the study area and 8% of the historic site area falls within the low probability zone.

From its inception, the GBRI cultural resources probability model functions was conceived as a pattern recognition tool rather than as an explanatory model relating to human adaptive response. Buffers within evidential themes were chosen since they represent potential foraging radii, or in the case of slope, habitable ground, but the results are never synthesized to suggest a causal relationship. Evidential themes provide only a recognizable landscape layer that can be contrasted against site density patterns.

Since the model is based upon pattern recognition, subsequent inventories and new site data may provide subtle, or in some cases dramatic changes to the distributional patterns. Certain classes within an evidential theme may have been inadequately sampled during previous investigations, or sites poorly reported. Newly acquired data may effectively increase both inventoried strata and drive results towards more or less predictable distributions. Recently acquired data supports that proposition.

The of the Spring/Steptoe Valley analytic unit revealed that in addition to several other themes, flats, within landform, were moderately predictive. A recent field investigation, not included as data in generating the current model, identified 163 sites within approximately 20,550 acres (83.16 km^2) along the eastern slope of the Egan Range south and west of Ely, Nevada. Approximately 4300 acres (17 km^2) were previously inventoried, resulting in a net increase of 16,250 acres (65.77 km^2) of inventory. (**Table 6.3**) Most of the inventory was conducted within the piedmont landform, effectively increasing the investigated area within that evidential class from 2.7% to 5.7% of the analytic unit Additional sites reported within the piedmont, increase site distributions within that zone from 20% of all sites (using the model data) to 27% of all sites within the analytic unit. Slightly more than 20% of the analytic unit comprises the piedmont zone.

Figure 6.1 Distribution of Prehistoric Site Area by Probability Zone

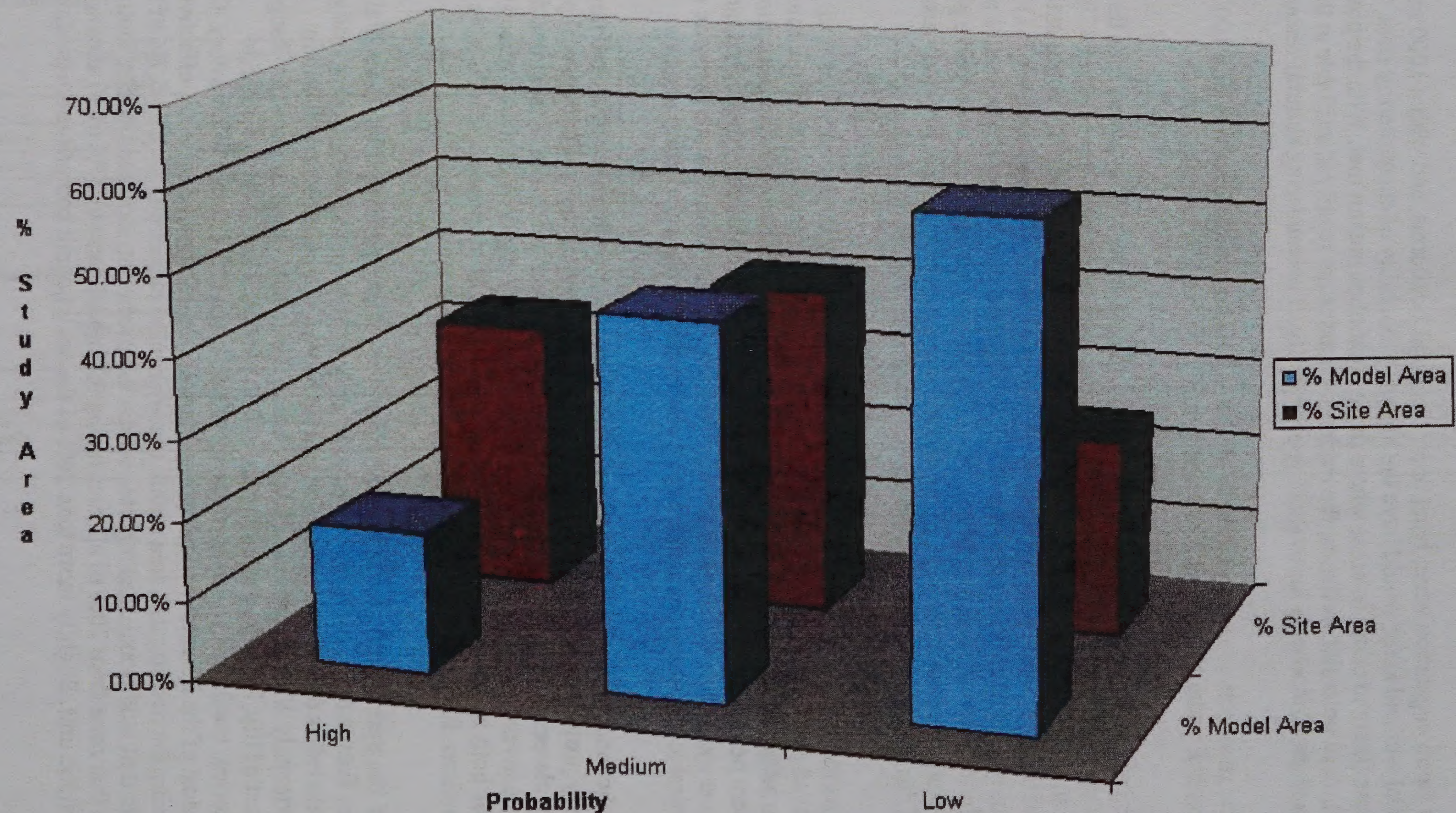
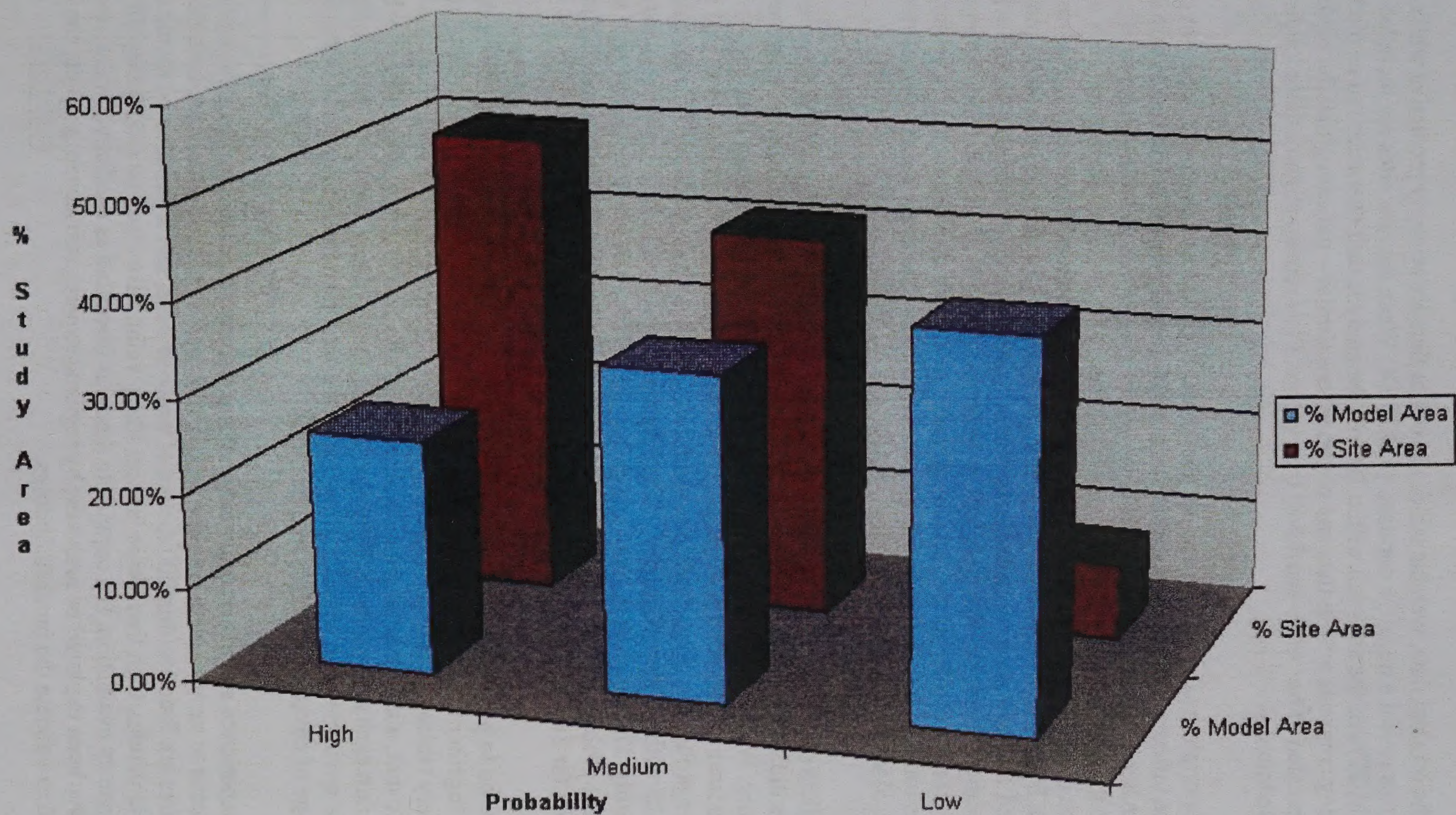


Figure 6.2 Distribution of Historic Site Area by Probability Zone



With the original data, weights tables show that flats are strongly predictive while other landforms reveal a negative contrast. (Table 6.4) When the new sites are included in the analysis, 27% of the sites fall within 20% of the analytic unit characterized as piedmont. Resulting contrasts within flats and piedmont are similar – indicating that the piedmont is now revealed to be "more sensitive" than before. Flats remain slightly more predictive than piedmont.

The important lesson of the example above is that we can anticipate the model to change as more information becomes available. A second survey again helps to illustrate how this can occur, especially when initial inventories are small. In Spring/Steptoe, the model data contains 65 sites within 77 square kilometers of inventoried piedmont (16% of all of the sites in the analytical unit, 20% of the inventoried area within the analytical unit as a whole). However, a single new inventory that covered 35 square kilometers of piedmont, revealed 102 new sites. With the inclusion of this new data, 29% of all sites fall within the piedmont zone, and the piedmont zone comprises 25% of all inventoried ground. The statistical significance of the ratio differences (percent of sites: percent of inventory) may be questionable, but it illustrates how new inventory will change our picture of specific analytical units.

Regardless of the effect of the new data, the model derived for Spring and Steptoe Valleys did adequately predict probability of encountering resources within the new inventory. While the spatial extent of sites that were identified during the new reconnaissance was not available, each site was buffered to a 2 acre extent so that site area per probability zone could be calculated. (Table 6.5) Over 50% of the inventory area falls within the medium probability zone and less than 12% falls within areas of high probability. Utilizing the derived site extent, 76% of the site areas lie within high to moderate probability zones with the remainder falling within the low probability area that accounts for 38% of the inventoried extent.

In addition to providing probability layers useful for long range planning, the model also brings together site and inventory information useful for short and long term planning. Summary tables and related shapefiles identify the percentage of inventory within each analytic unit, and assess the relative densities of site area to cumulative inventory blocks and within each analytic unit. They also identify proportional survey coverage within specific environmental settings, allowing the cultural resources manager to better assess the range of coverage within a resource area.

Field experience and expert knowledge of the regions within the project area provide the best means to verify model results. If regional expertise has intuitively predicted that most sites are found within 200 meters of water sources, and the evidential theme reflects a similar pattern, then that theme is most likely valid. Likewise, the model may direct confirmatory evaluation. If a composite theme is identified as predictive in the model, but has never been explored or evaluated by regional experts, subsequent projects can be tailored to validate the model's findings.

Table 6.4 Updated Spring/Steptoe Valley Contrast

	Model Area	%Total Area	Total # Sites	%Total Sites	CONTRAST	New Sites	New Site Total	New Site % Total	CONTRAST
Flat	7095.05	51.5%	594	72.2%	0.9725	54	648	65.7%	0.5192
Piedmont	2778.41	20.2%	164	19.9%	-0.1109	102	266	27.0%	0.4688
Mountain	3908.92	28.4%	65	7.9%	-1.5232	7	72	7.3%	-1.6006
Total	13782.39	100.0%	823	100.0%		163	986	100.0%	

Table 6.5

Additional Reconnaissance Model Summary (Composite)

	High	Medium	Low	Total
Inventory Area (m^2)	9412821.0000	42111556.0000	31638964.0000	83163341.00
Inventory Area (km^2)	9.41	42.11	31.64	83.16
% Inventory Area	11.32%	50.64%	38.04%	100.00%
Inventory Sites Area (m^2)	64047.9922	858689.9375	289705.4688	1212443.40
Inventory Sites Area (km^2)	0.06	0.86	0.29	1.21
% Inventory Site Area	5.28%	70.82%	23.89%	100.00%
Inv site area / Inv Area	**0.0068**	**0.0204**	**0.0092**	**0.0146**

The IMACS assemblage data provides a useful tool for deciphering cultural patterns and compilation of overview information. Unfortunately, the quality of data and its completeness are variable, often dependent upon age of the record. The IMACS encoding form itself also lacks a level of information that could answer more specific research questions. Lithic assembalge characteristics, such as frequency by material type, are not preserved in the encoding format and the assessments of lithic stages are inconsistent. Older site records pose additional constraints to completeness of the assemblage database since IMACS classifications must be derived from narrative descriptions.

Several problems were also encountered in the creation of a comprehensive assemblage database that was compiled from electronic data maintained by three separate entities. Administrative data is consistent across the three database used in the analysis, but assemblage data varies from complete IMACS encoding to descriptive summaries of the cultural assemblage. Consistency in reporting National Register eligibility also varies between agency and archive. In some cases, current status is maintained in IMACS format within the site database, in others a separate database contains that information.

Shortcomings of the databases can be overcome in future projects by scaling database contents to fit the project goals. A broad based predictive model can be constructed from existing assemblage data with minimal effort if research questions are limited in scope. Where do we expect prehistoric sites? Where do we expect historic sites? Where do National Register sites occur? More detailed synthesis requires mining data from any combination of existing electronic data and paper records for completeness and missing information. What types of materials comprise the lithic debitage? Are lithic tools manufactured from materials available locally?

Scale of the analytic area should also be adjusted to fit the research questions. Another problem encountered with the anthropological analysis was the validity of generalizing results to fit such a broad research area. Variations in survey quality, site reporting, and archival data over an area in excess of 78,000 square kilometers can only elucidate very general patterns. As research questions become more pointed, the research area needs to be scaled down, evidential themes refined to be more specific, and site information scrutinized to assure validity of the observations. Patterns unique to the Upper Snake hydrologic unit may not be valid for the Southern Great Salt Lake Desert.

Planning Models As Cultural Resource Forecasts

The GBRI cultural resources model study is phrased as two map layers (distributed as Environmental Systems Research Institute (ESRI) GRID format files (**Ancillary CD 1**). One map layer is for prehistoric resources, the other for historic resources. The user of these map layers must be well aware of several important aspects of them.

The map layers are summaries of models, not "known" data. Just as fire managers do not really know the accuracy of their fuel regime models until fire actually consumes a spot,

we cannot know how accurate the models are currently. The examples above suggest that survey bias, differences in reporting styles (sites vs. isolates), and imprecision in the baseline data will all contribute to inaccuracy. Below, we discuss long-term strategies for coping with these problems; here, we wish to call attention to the nature of the models and maps.

Models and maps are planning tools, not compliance tools. One cannot use the GIS data to say an area will be devoid of cultural resources just because it has a LOW value associated with it. For these reasons, we prefer to call the GBRI model a *planning model* rather than a predictive model. The maps (paper or electronic), which summarize are current planning-level knowledge, are thus *forecasts*. The simile to meteorology is not accidental, for we do not fully understand the system that generated the cultural resources we are attempting to forecast. Yet, just as a forecaster can state that a particular weather pattern is highly likely to yield snow in the Sierra – without necessarily understanding *why* the pattern occurs – the GBRI model can forecast areas of highest and lowest likelihood of cultural resources. If one thinks of the models and map summaries as forecasts, rather than facts, appropriately cautious planning will likely ensue.

One must also bear in mind data quality limitations that went in to the creation of the planning models. Digital terrain data is fairly good – 30 meter intervals between fairly accurate elevations – but vegetation data is rather poor. Vegetation data was derived in part from 500 meter grid cells of predicted natural vegetation. Thus, the worst common spatial denominator in the model is 500 meters. This has a major effect on the boundary between very different vegetation regimes, such as the piedmont to montane margin.

The solution to many of these limitations lies in utilizing the model frequently. Actively noting inconsistencies (and consistencies) with forecast values will point out areas of poor baseline data, insufficient archaeological knowledge, or both. Both deficiencies can be remedied. Baseline data can be fixed on a local level, and more inventory in poorly-represented settings can be a management goal. From a land use perspective, confirming LOW forecast areas may be the highest priority.

Maintaining the model is critical to its utility. Field protocols for gathering model data are straightforward. A simple tally sheet for each inventory can be created that summarizes the areal coverage in each model zone, and the revealed size density within each zone. Each inventory and resource should be held in GIS, verified, and flagged as not having contributed to the current generation of the model. Periodically, the model maintainers need to review new information and decide what effort should be put in to model revisions. This could be as simple as just changing the forecast maps without statistical re-analysis or as comprehensive as running entirely new tallies and contrasts.

Resource distributions, overall, are relatively sensible. It is not difficult to understand the distribution of historic resources within the sensitivity model. They tend to lie near to water and near to transportation routes. This generalization shows clearly within each of the analytical unit studies. Nevertheless, as a forecast of where significant or interesting historic resources will be found, the map layers should be used cautiously. For example, a

recent inventory of 10,000 acres within the Ely Field Office management area revealed few large historic sites, but dozens of dispersed small scatters of cans and some glassware. These were likely sheep camps. Careful analysis and locating of these seemingly insignificant, uninteresting, sites revealed a good deal about the settlement pattern of early twentieth century sheep-rearing. Each individual site would not have been considered significant; together they are a potential National Register landscape (Clay, personal communication 2002).

Prehistoric resources are more difficult to understand in simple factorial ways. The variation from one study unit to the next is somewhat unexpected. In some units, there are "sensible" reasons. For example, marshes and dunes (which lie along flat-piedmont interfaces) are important areas for food resources in the Bonneville Basin. Sites tend to be more frequent in these places. Other results are less "sensible". Why should sagebrush flats be more likely to contain archaeology than piedmont in several of the Nevada study units? Why is water sometimes a negative factor? As promised, we offer no answers for these questions. They do make clear the importance of continuing to develop explanatory (causal, deductive) models alongside of correlation forecasts. The kind of study presented here, (an example of the latter activity) will be improved by creating forecasts from a better understanding of the rationale behind prehistoric behavior.

Planning Models As Tools

The utility and limitations for the planning model have been discussed above, but it is worth reiterating these again. The appropriate use of these tools is:

- Long range planning
- High probability relates to greatest likely overall expense
- Low probability equates with fewer resources, lower overall expense.
- If fewer sites are encountered, then testing, mitigation costs are reduced.
- Low probability does not mean no sites and does not obviate the need for fieldwork. But fieldwork should be faster and cheaper, on average.
- As model is verified further, cultural resource managers may want to examine different level of investigation within low probability areas.
- Models and forecasts articulate current state of knowledge. Thus they need maintenance.

Closing Perspectives

The GBRI model study was, we think, successful. Success is always a relative term. For this study, one goal was to evaluate the feasibility of building extensive landscape-level models. A feasibility evaluation was achieved: yes, this is feasible. Another goal was then to build such a model. This goal was also met in a series of analytical unit studies. A third goal was to examine how the model could best be used. This goal was partially met.

Above, we proposed ways in which the model and forecasts can be used and improved. This should be a continual work in progress as managers and scientists work together to improve ways in which decisions are made.

Future work and elaboration needs to focus on improving survey methods, continually evaluating the model and forecast reliability, "fixing" the forecasts, and revising the model with better baseline environmental data. All of these future action recommendations pre-suppose agency use of the forecasts in the first place, and an audience for them. The agency staff, external researchers, and managers with whom we worked on this study are all sincerely interested in the success of landscape-level analyses. We think this is the best forecast, in itself, of continued use for this research.

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